PC Based Digital Oscilloscope

USER MANUAL

DSO3102 DSO3102A

DSO3202 DSO3202A

www.hantek.com

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General Safety Summary

Review the following safety precautions carefully before operate the device to avoid any personal injuries or damages to the device and any products connected to it.
To avoid potential hazards use the device as specified by this user's guide only.

◆**To Avoid Fire or Personal Injury**

◆**Use Proper Power Cord.** Use only the power cord specified for this product and certified for the country of use.

◆**Connect and Disconnect Properly.** Do not connect or disconnect probes or test leads while they are connected to a voltage source.

◆**Connect and Disconnect Properly.** Connect the probe output to the measurement device before connecting the probe to the circuit under test. Disconnect the probe input and the probe reference lead from the circuit under test before disconnecting the probe from the measurement device.

◆**Observe All Terminal Ratings.** To avoid fire or shock hazard, observe all ratings and markings on the product. Consult the product manual for further ratings information before making connections to the product.

◆**Use Proper Probe.** To avoid shock hazard, use a properly rated probe for your measurement.

◆**Avoid Circuit or Wire Exposure.** Do not touch exposed connections and components when power is on.

◆**Do Not Operate With Suspected Failures.** If suspected damage occurs with the device, have it inspected by qualified service personnel before further operations.

◆**Provide Proper Ventilation.** Refer to the installation instructions for proper ventilation of the device.

◆**Do not operate in Wet/Damp Conditions.**

◆**Do not operate in an Explosive Atmosphere.**

◆**Keep Product Surfaces Clean and Dry.**

Chapter 1 Getting Start

The oscilloscope is small, lightweight, no external power required, portable oscilloscopes! The oscilloscopes is ideal for production test, research and design and all of the applications involving analog circuits test and troubleshooting, as well as education and training.

In addition to the list of general features on the next page, this chapter describes how to do the following tasks:

- **System Requirements**
- **Install software**
- **Install Driver**
- **General Features**
- **General Check**
- **Probe Compensation**
- **Function Check**
- **Self Calibration**
- **Accessories**

1.1 System Requirement

To run the oscilloscope software, the needs of computer configuration are as follows:

Minimum System Requirements

Operating System
Window XP/Vista/Win 7/Win 8

Processor
Upwards of 1.00G processor

Memory
256M byte

Disk Space
500M disk free space

Screen resolution
800 x 600

Recommended Configuration

Operating System
Windows XP SP3 Syst**em**

Processor
2.4G Processor

Memory
1G Byte Memory

Disk Space
80G Disk Space

Screen resolution
1024 x 768 or 1280 x 1024 resolution

DPI Setting
Normal Size (96DPI)

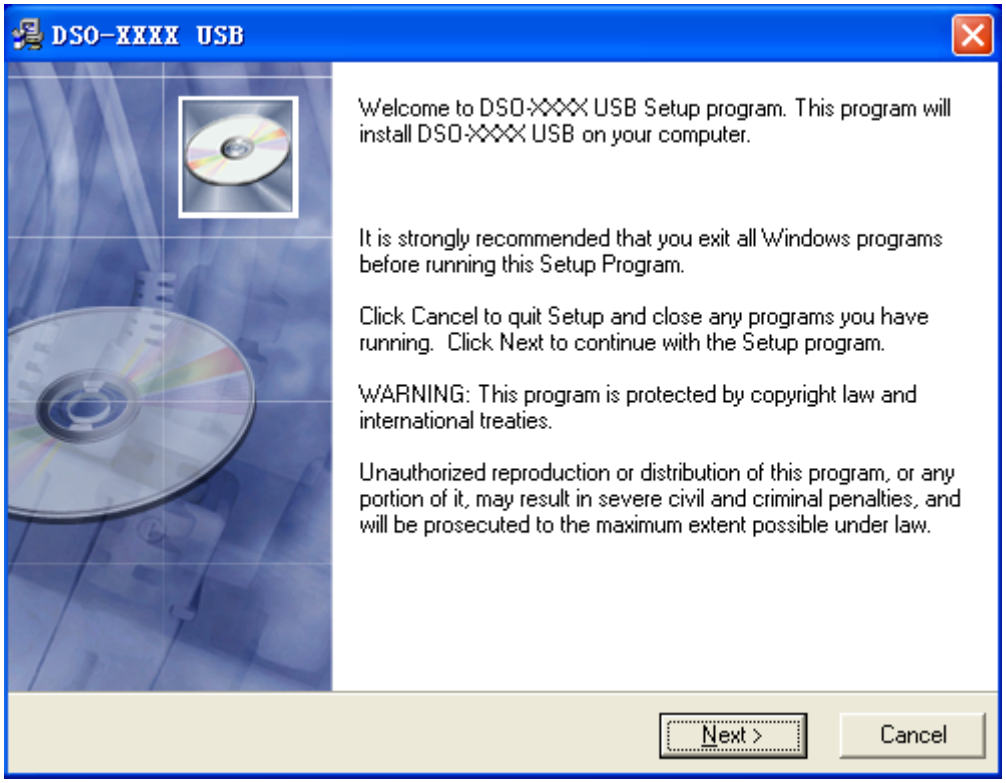
1.2 Install Software

Caution: You must install the software before using the oscilloscope.

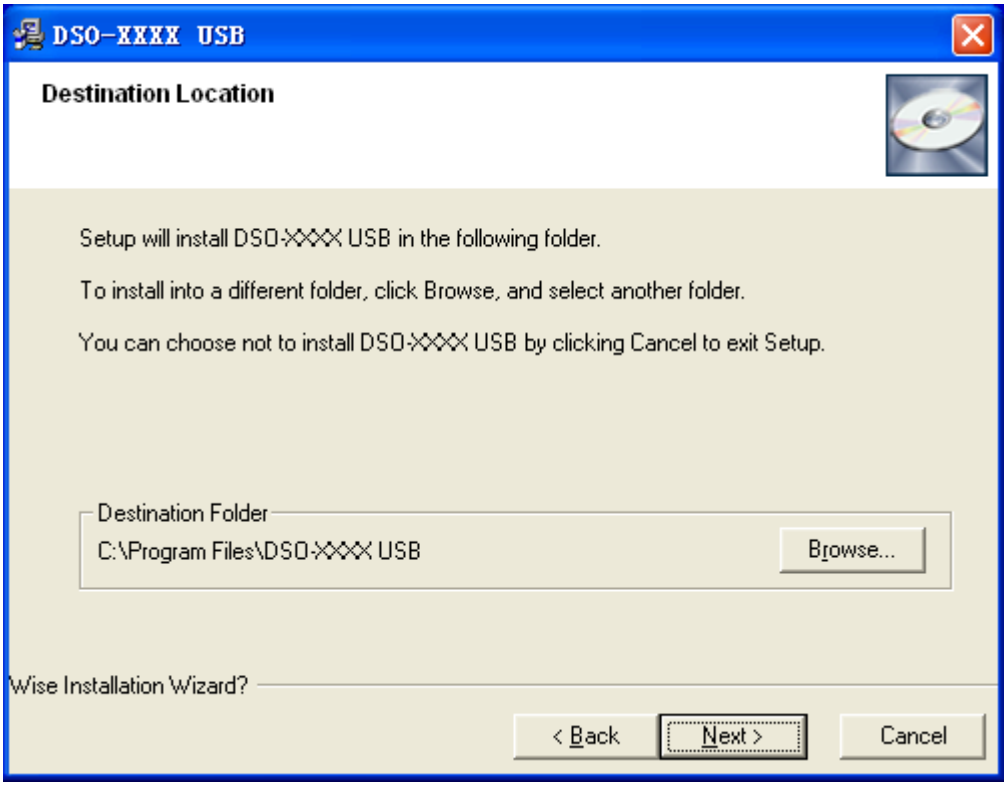
1. While in Windows, insert the installation CD into the CD-ROM drive.

2. The installation should start up automatically. Otherwise in Windows Explorer, switch to the CD-ROM drive and run Setup.exe.

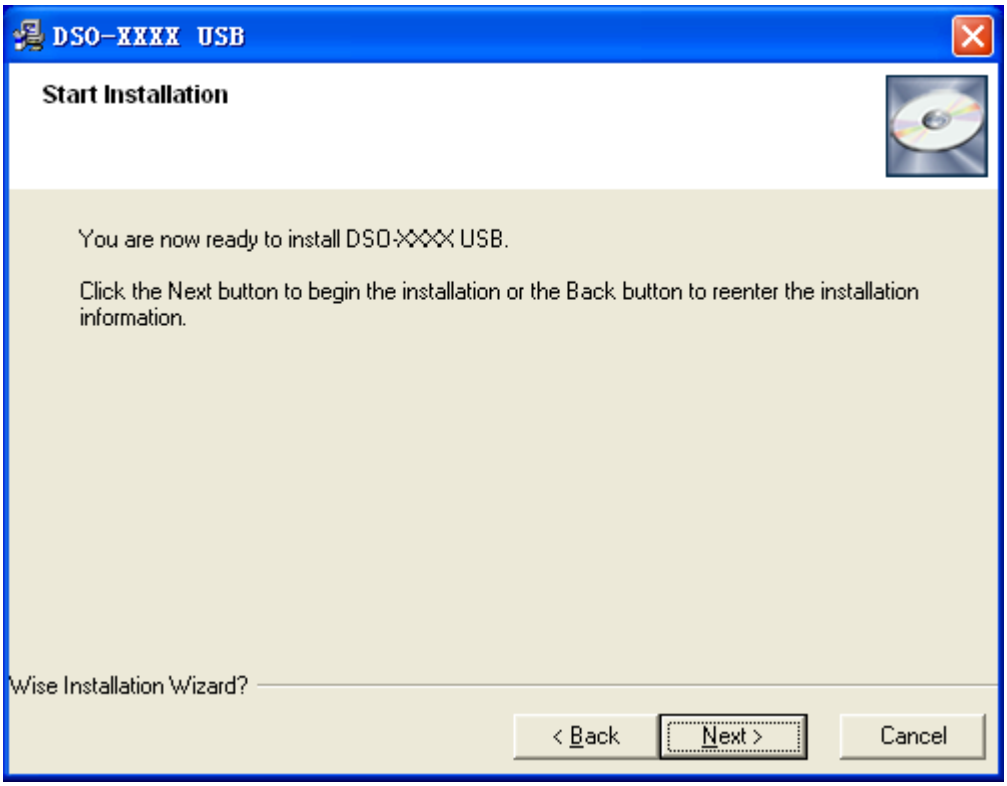
3. The software Installation is started. Click 'Next' to continue.


DSO-XXXX USB
Welcome to DSO-XXXX USB Setup program. This program will install DSO-XXXX USB on your computer.
It is strongly recommended that you exit all Windows programs before running this Setup Program.
Click Cancel to quit Setup and close any programs you have running. Click Next to continue with the Setup program.
WARNING: This program is protected by copyright law and international treaties.
Unauthorized reproduction or distribution of this program, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under law.
Next >
Cancel

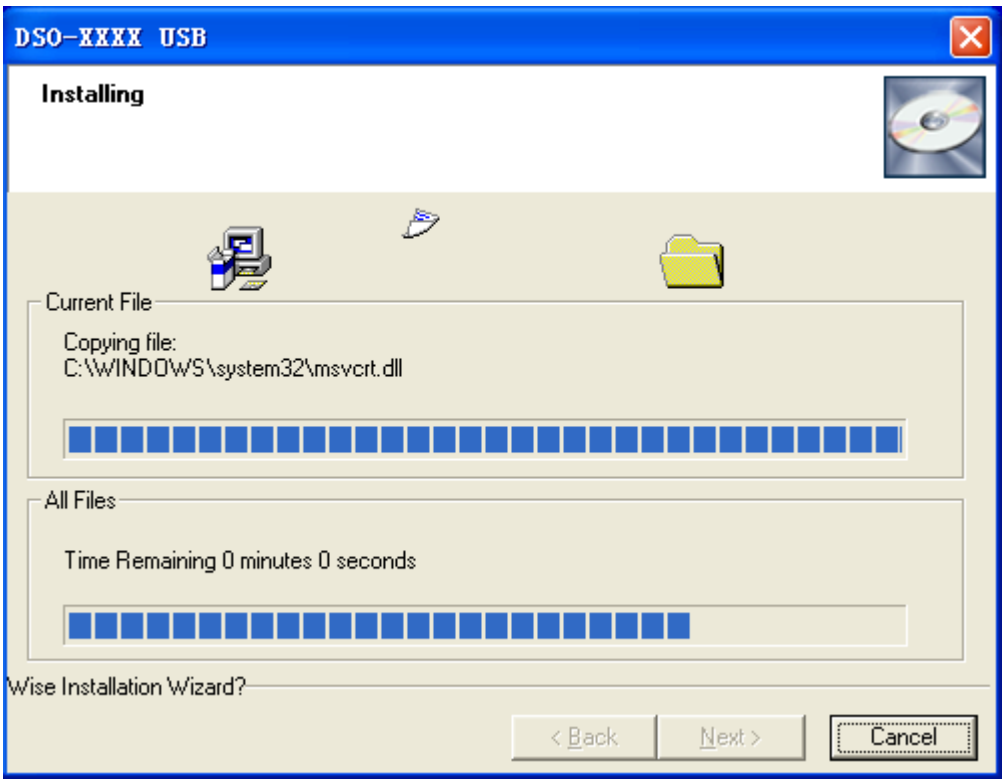
4. Choose a destination directory. Click 'Next' to continue.


DSO-XXXX USB
Destination Location
Setup will install DSO-XXXX USB in the following folder.
To install into a different folder, click Browse, and select another folder.
You can choose not to install DSO-XXXX USB by clicking Cancel to exit Setup.
Destination Folder
C:\Program Files\DSO-XXXX USB
Browse...
Wise Installation Wizard?
< Back
Next >
Cancel

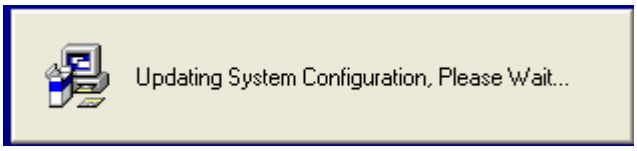
5. Check the setup information. Click Next to start copying of files.


DSO-XXXX USB
Start Installation
You are now ready to install DSO-XXXX USB.
Click the Next button to begin the installation or the Back button to reenter the installation information.
Wise Installation Wizard?
< Back
Next >
Cancel

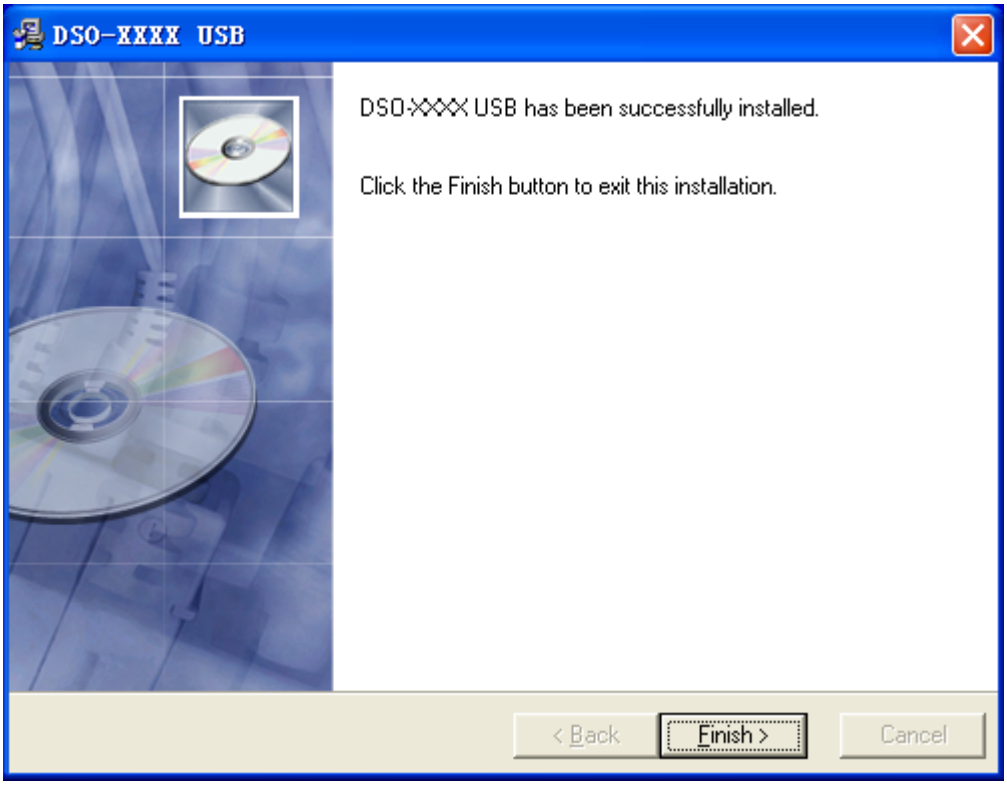
6. This Status dialog is displayed during copying of files.



7. Updating Your System Configuration.



8. The installation is complete.



1.3 Install Driver

1.Connect the A-Type Plug of USB cable to your PC'S USB port.

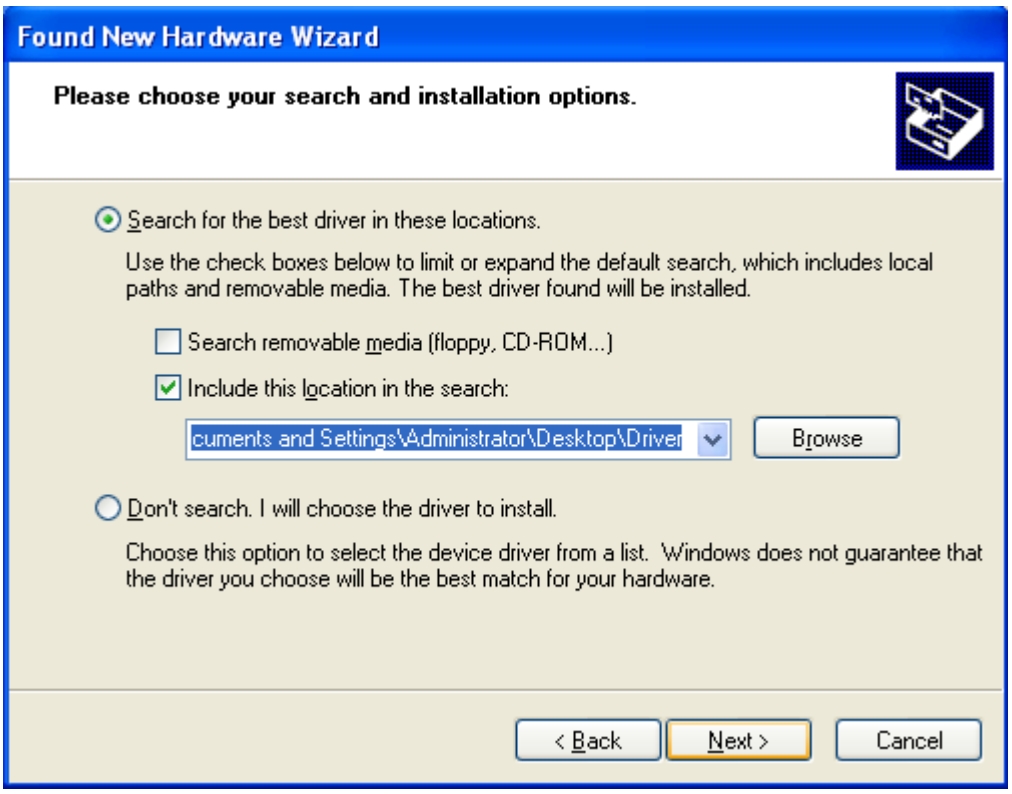
2.Connect the other A -Type Plug of USB cable to the device's USB port.

3.New hardware is found.

4.New hardware search wizard starts.

Found New Hardware Wizard
This wizard helps you install software for:
DSO-XXXX USB DRIVER
If your hardware came with an installation CD or floppy disk, insert it now.
What do you want the wizard to do?
Install the software automatically (Recommended)
Install from a list or specific location (Advanced)
Click Next to continue.
< Back
Next >
Cancel

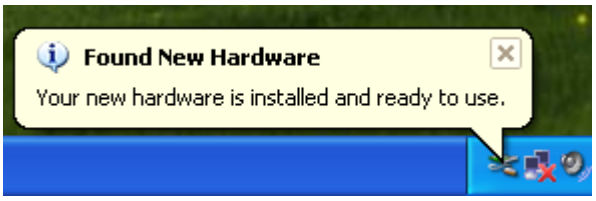
5.Select the specific location.


Found New Hardware Wizard
Please choose your search and installation options.
Search for the best driver in these locations.
Use the check boxes below to limit or expand the default search, which includes local paths and removable media. The best driver found will be installed.
Search removable media (floppy, CD-ROM...)
Include this location in the search:
cuments and Settings\Administrator\Desktop\Driver
Browse
Don't search. I will choose the driver to install.
Choose this option to select the device driver from a list. Windows does not guarantee that the driver you choose will be the best match for your hardware.
< Back
Next >
Cancel

6.New hardware search wizard starts to search the driver.

7. The wizard has finished installing for the device.

8.The new hardware is installed and ready to use.



1.4 General Features

Product Features:

- **Four Channels, Bandwidth:**

  100MHz (DSO3102)
  150MHz (DSO3102A)
  200MHz (DSO3202)
  250MHz (DSO3202A)

- **Maximum real-time sample rate:**

  1GSa/s

- **Memory depth:**

  10K-256M/CH

- **Automatic setup for ease of use (AUTOSET);**
- **Pass/Fail;**
- **Built-in Fast Fourier Transform function(FFT);**
- **20 Automatic measurements;**
- **Automatic cursor tracking measurements;**
- **waveform storage, record and replay dynamic waveforms;**
- **User selectable fast offset calibration;**
- **Add, Subtract , Multiply and Division Mathematic Functions;**
- **Selectable 20 MHz bandwidth limit;**
- **External trigger;**
- **Waveform average;**
- **Adjustable waveform intensity, more effective waveform view;**
- **User interface in several user-selectable languages;**

1.5 General Check

Please check the instrument as following steps after receiving an oscilloscope:

Check the shipping container for damage:
Keep the damaged shipping container or cushioning material until the contents of the shipment have been checked for completeness and the instrument has been checked mechanically and electrically.

Check the accessories:
Accessories supplied with the instrument are listed in "Accessories" in this guide. If the contents are incomplete or damaged, please notify the franchiser.

Check the instrument:
In case there is any mechanical damage or defect, or the instrument does not operate properly or fails performance tests, please notify the franchiser.

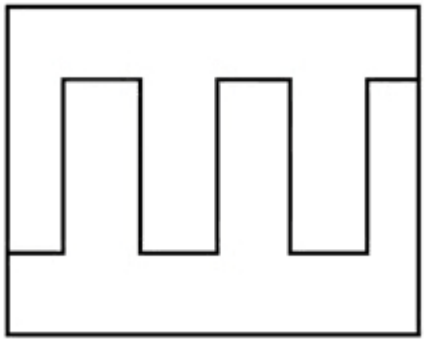
Probe Compensation

Perform this function to match the characteristics of the probe and the channel input. This should be performed whenever attaching a probe to any input channel at the first time.

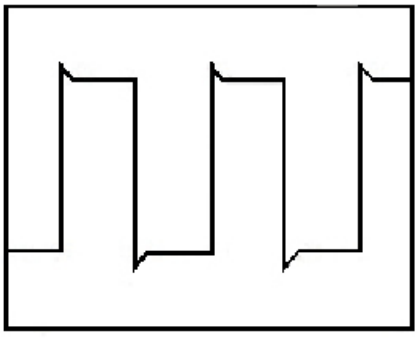
■ From the “Probe” menu, select attenuation to 1:10. Set the switch to “X10” on the probe and connect it to CH1 of the oscilloscope. When using the probe hook-tip, insert the tip onto the probe firmly to ensure a proper connection.

■ Attach the probe tip to the Probe Compensator and the reference lead to the ground connector, select CH1, and then press the “**AUTOSET**” button into the menu or the toolbar.

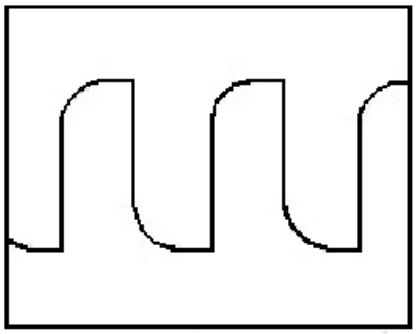
■ Check the shape of the displayed waveform.



Correctly Compensated



Over Compensated



Under Compensated

1. If necessary, use a non-metallic tool to adjust the trimmer capacitor of the probe for the fattest square wave being displayed on the oscilloscope.
2. Repeat if necessary.

WARNNING: To avoid electric shock while using the probe, be sure the perfection of the insulated cable, and do not touch the metallic portions of the probe head while it is connected with a voltage source.

1.6 Function Check

Perform this functional check to verify that your oscilloscope is operating correctly.

■ Connect the oscilloscope

You should connect the A-Type Plug of USB cable to your PC USB port and connect the other A-Type Plug of USB cable to oscilloscope USB port.

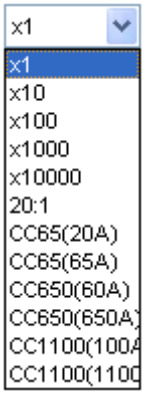
■ Input a signal to a channel of the oscilloscope

The oscilloscope is equipped with two channels plus external trigger.

Please input signal in the following steps:

1. Set the attenuation switch on the probe as 10X and connect the probe on the oscilloscope with CH1. Aim the slot in the probe connector at the faucet on BNC of CH1 and insert, then, turn right to lock the probe. Finally, attach the tip of probe and ground nip to the Connector of Probe compensator.

2. Set the CH1 probe attenuation of the oscilloscope to X10. (The default is X1).



3.Attach the tip of probe and ground nip to the Connector of Probe compensator. Click the

button. A square wave will be displayed within a several seconds. (Approximately 1 kHz, 2V, peak-to- peak).

4. Inspect CH2 with the same method. Repeat steps 2 and 3.

1.7 Self Calibration

The self calibration routine lets you optimize the oscilloscope signal path for maximum measurement accuracy. You can run the routine at any time but you should always run the routine if the ambient temperature changes by 5v or more. For accurate calibration, power on the oscilloscope and wait twenty minutes to ensure it is warmed up. To compensate the signal path, disconnect any probes or cables from the input connectors.
Then, access the **"Utility -> Calibration"** option and follow the directions on the screen.
The self calibration routine takes about several minutes.

1.8 Accessories

All the accessories listed below are standard accessories for the oscilloscope:

◆Probe×2 (1.5m), 1:1, (10:1) Passive Probes

◆A Power Adapter

◆A USB Cable

◆A PC software CD

Chapter 2 Operating Basics

◆**The User's Interface**

◆**The Menu System**

◆**The Vertical System**

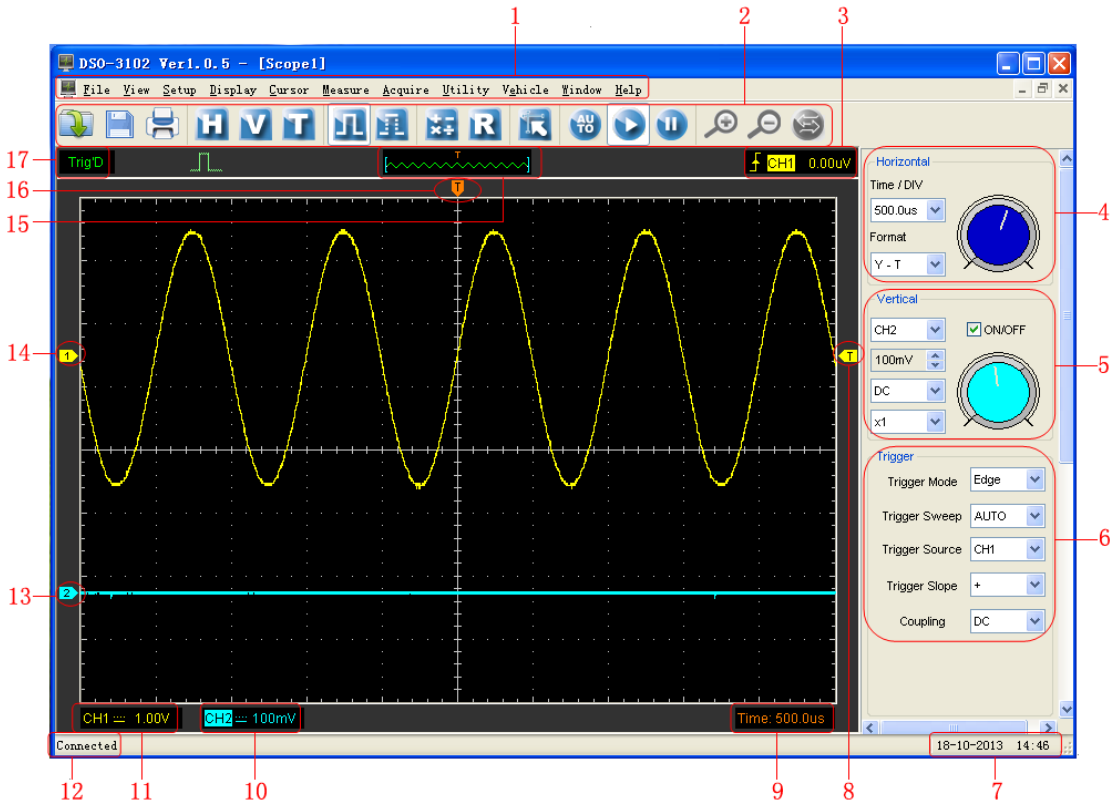
◆**The Horizontal System**

◆**The Trigger System**

◆**Input Connectors**

2.1 The User's Interface

Click the software icon on the desk after you finished the software setting and equipment connecting. Then a user interface will be showed as follows:



In addition to displaying waveforms, the display area is filled with many details about the waveform and the oscilloscope control settings.

1.The Main Menu

All settings can be found in the main menu.

2.The Toolbar

3. It shows the trigger information

It shows the edge trigger slope, source and level.

4.The Horizontal Panel

The user can change Time/Div, format in the panel.

5.The Vertical Panel

The user can turn on/off the CH1/CH2. Also the user can change the CH1/ CH2 volt/div, coupling and probe attenuation.

6.The Trigger Panel

In this panel, the user can change the trigger mode, sweep, source and slope.

7. It shows the system time.

8. Marker shows Edge trigger level.

9. It shows the main time base setting.

10.It shows the CH2 information

Readouts show the coupling of the channels.

Readouts show the vertical scale factors of the channels.

A “B” icon indicates that the channel is bandwidth limited

11. It shows the CH1 information

Readouts show the coupling of the channels.

Readouts show the vertical scale factors of the channels.

A “B” icon indicates that the channel is bandwidth limited

12. It shows the software status.

13.The markers show the CH2reference points of the displayed waveforms. If there is no marker, the channel is not displayed.

14. The markers show the CH1reference points of the displayed waveforms. If there is no marker, the channel is not displayed.

15. A window that shows the display waveform in buffer position.

16. Marker shows horizontal trigger position.

17. Marker shows horizontal trigger position.

Trigger status indicates the following:

AUTO: The oscilloscope is in auto mode and is acquiring waveforms in the absence of triggers.

Trig’D: The oscilloscope has seen a trigger and is acquiring the post trigger data.

WAIT: All pretrigger data has been acquired and the oscilloscope is ready to accept a trigger.

STOP: The oscilloscope has stopped acquiring waveform data.

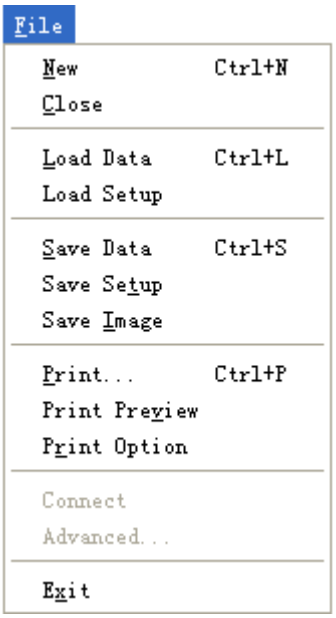
RUN: The oscilloscope is running.

PLAY: The oscilloscope is displaying the record waveforms.

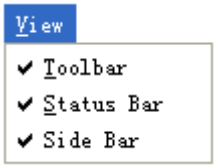
2.2 The Menu System

The Main Menu:

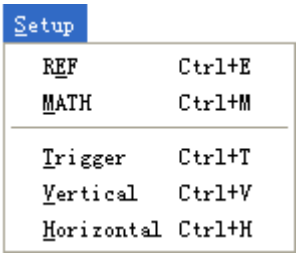
1.**File**: Load or Save data, setup



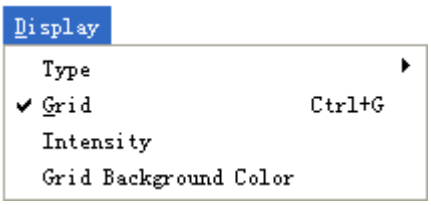
2.**View**: Change the user interface



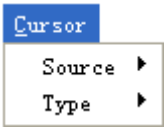
3.**Setup**: Setup setting



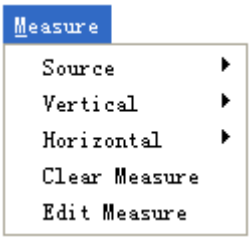
4.**Display**: Change wave display type



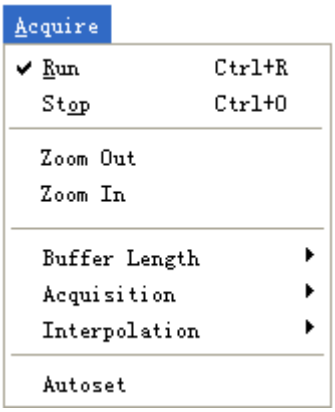
5.**Cursor**: Set Cursor measure type



6. **Measure**: Set measurement parameters

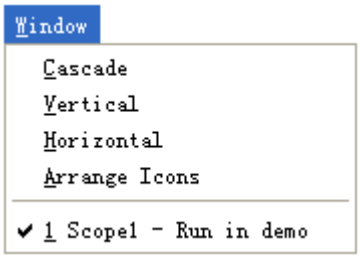


7.**Acquire**: Run ,Stop or other operation setting



8. **Utility**: Utility setting

9. **Window**: Window setting

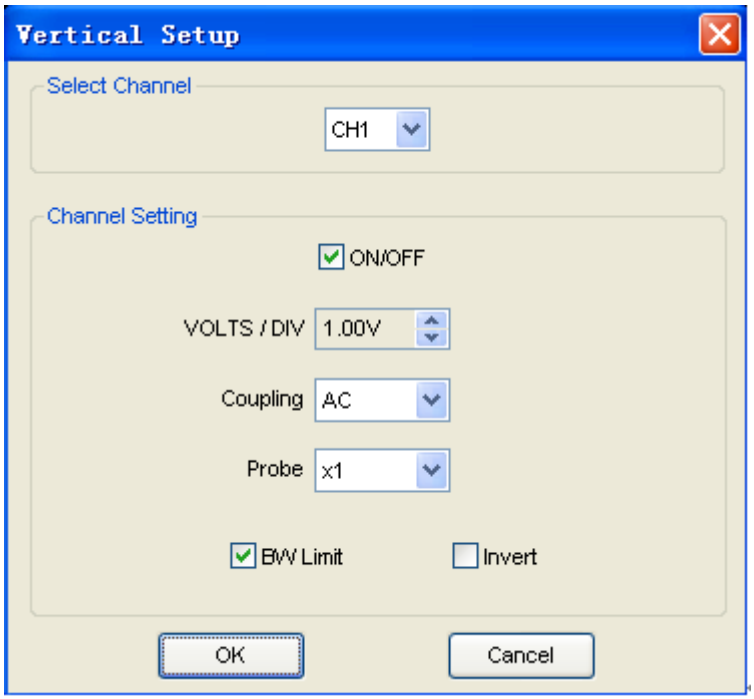


10. **Help**: Turn on help file

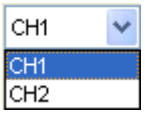
2.3 The Vertical System

Click **"Setup->Vertical"**

The following figure shows the vertical Setup window. It shows the vertical parameters setting.



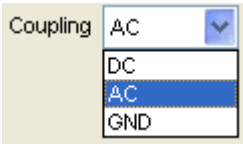
1.Select channel: User can select the channel by clicking the Combo box.



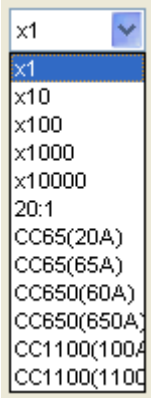
2.ON/OFF: Turn on or off the selected channel.

3.VOLTS/DIV: Set the selected channel voltage range.

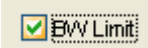
4.Coupling: Set the selected channel to DC/AC/GND.



5.Probe: Set the Select one according to the probe attenuation factor to ensure correct vertical scale reading



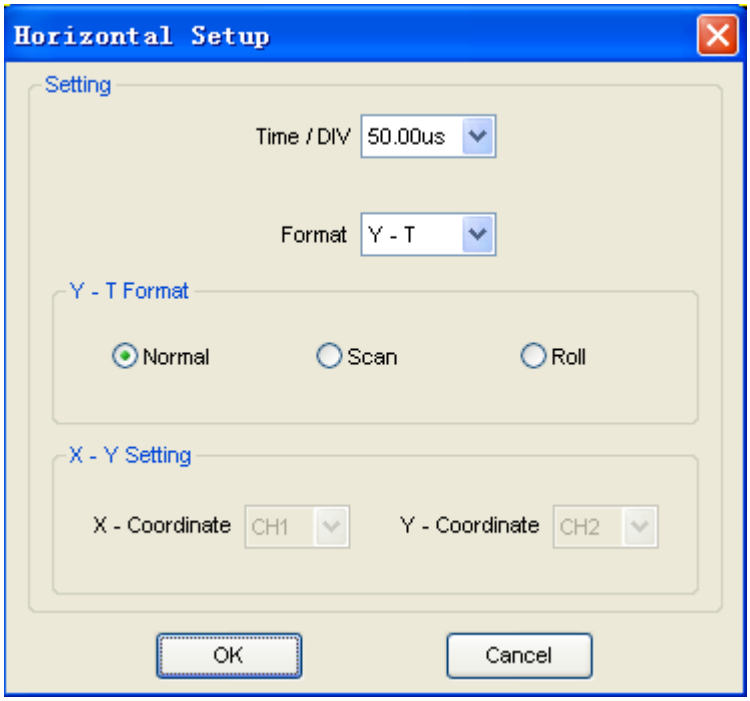
6.BW Limit: Reject the frequency component higher than 20MHz.



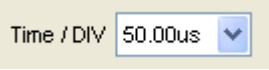
7.Invert: Invert the selected wave.

2.4 The Horizontal System

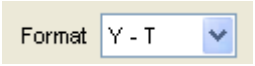
Click **"Setup->Horizontal"**
The following figure shows the Horizontal System window. It shows the horizontal parameters settings.



1.**Time/DIV**: leads the setting of the time base parameters



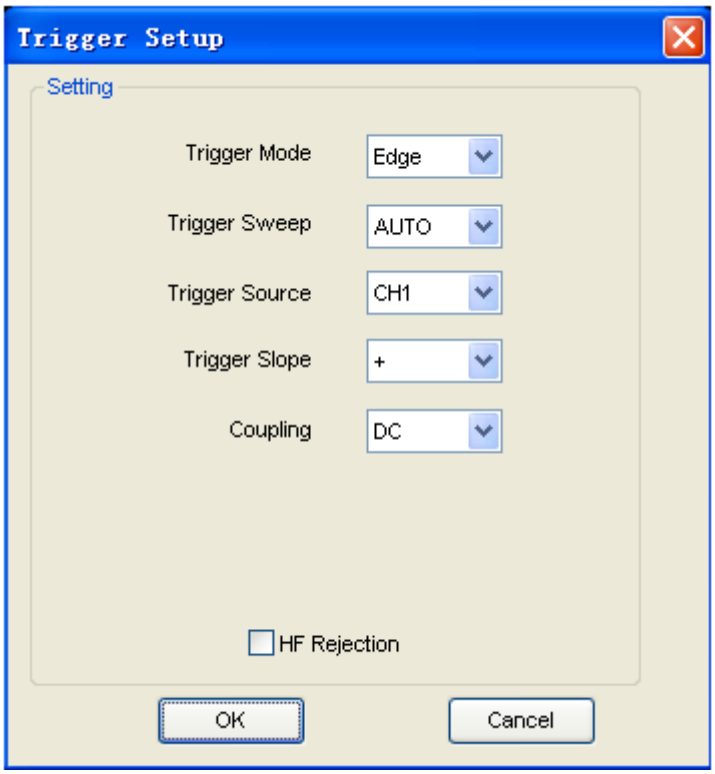
2. **Format**: leads the setting of the horizontal format parameters



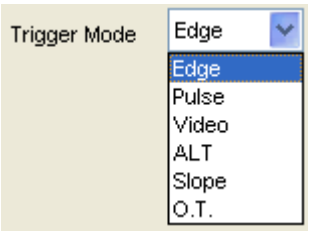
2.5 The Trigger System

Click **"Setup-> Trigger"**

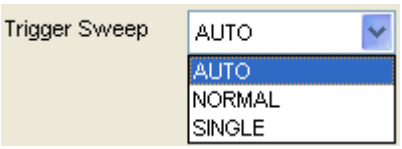
The following figure shows the trigger system control.



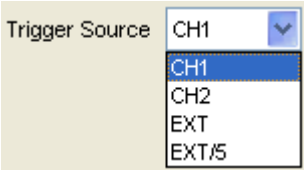
1.**Trigger Mode**: Sets the trigger mode



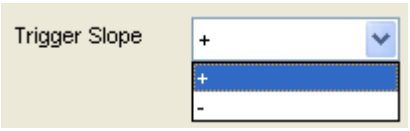
2.**Trigger Sweep**: Selects the trigger sweep mode to AUTO, NORMAL or SINGLE



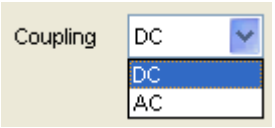
3.**Trigger Source**: Selects the trigger source to CH1, CH2, EXT and EXT/5.



4.**Trigger Slope**: Selects the trigger slope to Positive or Negative slope



5.**Trigger Coupling:** Selects the trigger coupling to DC or AC.



2.6 Input Connector

CH1/CH2: Input connectors for waveform display.

E-TRIG/S: Input connector for an external trigger source. Use the Trigger Menu to select the Ext. source.

Other Connector:

GND.: A ground terminal

USB PORT: Connect the USB cable to this port.

CAL.: Probe compensation output.

GPower: Power Input port.

Chapter 3 Oscilloscope Functions

◆**Set Oscilloscope**

◆**Set Vertical System**

◆**Set Horizontal System**

◆**Set Trigger System**

◆**Save/Load**

◆**Utility Function**

◆**Measure Signal**

◆**Zoom In/Out Waveforms**

◆**Acquire Signal**

◆**Print**

3.1 Setup the Oscilloscope

Using "AUOSET" to display a signal automatically.

Auto setup functions one time each time you push the "**AUTOSET**" button. The function obtains a stable waveform display for you. It automatically adjusts the vertical scale, horizontal scale and trigger settings. Auto setup also displays several automatic measurements in the graticule area, depending on the signal type.

Connect a signal to the CH1 input:

1. Connect a signal to the oscilloscope as described above.

2. Click the **"Acquire -> Autoset"** button.

The oscilloscope will change the current settings to display this signal.

Save Setup

The oscilloscope software saves the current setup before you close the oscilloscope software. The oscilloscope recalls this setup the next time you run the software. You can use the **"Save Setup"** menu to permanently save up to several different setups.

Load Setup

The oscilloscope can recall the last setup before the oscilloscope software was running, any saved setups, or the factory setup. You can use the "**Load Setup**" menu to permanently recall a setup.

Factory Setup

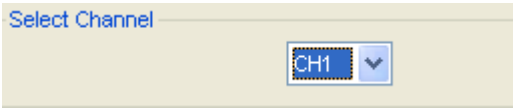
The oscilloscope software is set up for normal operation when it is shipped from the factory. This is the factory setup. To recall this setup, push the "**Factory Setup**" menu.

3.2 Set Vertical System

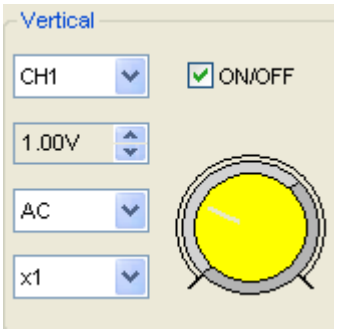
Set Channel

Click **“Vertical”** in **“Setup”** menu.

The Channel Selection



The Channel Control Panel in sidebar

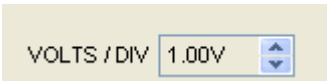


The Vertical function:

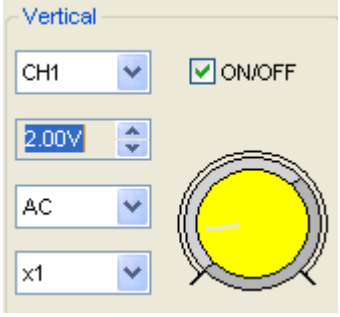
Turn ON/Off: Turn on/off the channel
Volt/DIV: Select the channel voltage/div
Coupling: Select the channel coupling
Probe: Select the channel probe attenuation
Invert: Turn on/off the invert function.

Change Volt/DIV

You can click “volt/Div” in” vertical Setup” window to select the voltage



You can also change the selected channel voltage in sidebar

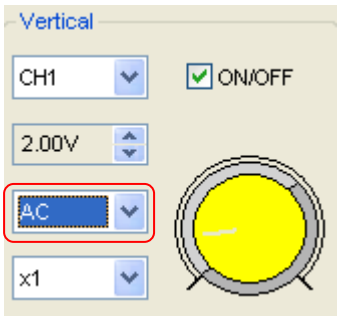


You can left click and drag the mouse on the knob to change the voltage.

Set Channel Coupling

Click **"Coupling**" in **"Vertical Setup"** window.

In the sidebar, you can change the channel coupling too.



You can set the coupling to **DC**, **AC** or **GND**. If you set the coupling to **DC**, it blocks the **AC** component of the input signal.

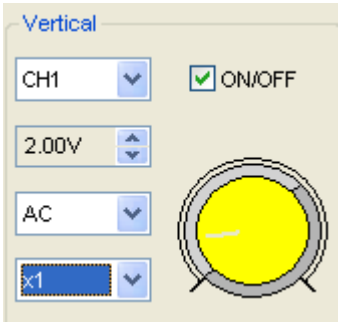
Probe Attenuation Setting

Select the attenuation factor for the probe. To check the probe attenuation setting, toggle the probe menu to match the attenuation factor of the probe.

This setting remains in effect before you changed again.

Click **"Probe**" in Vertical Setup window to select the probe attenuation

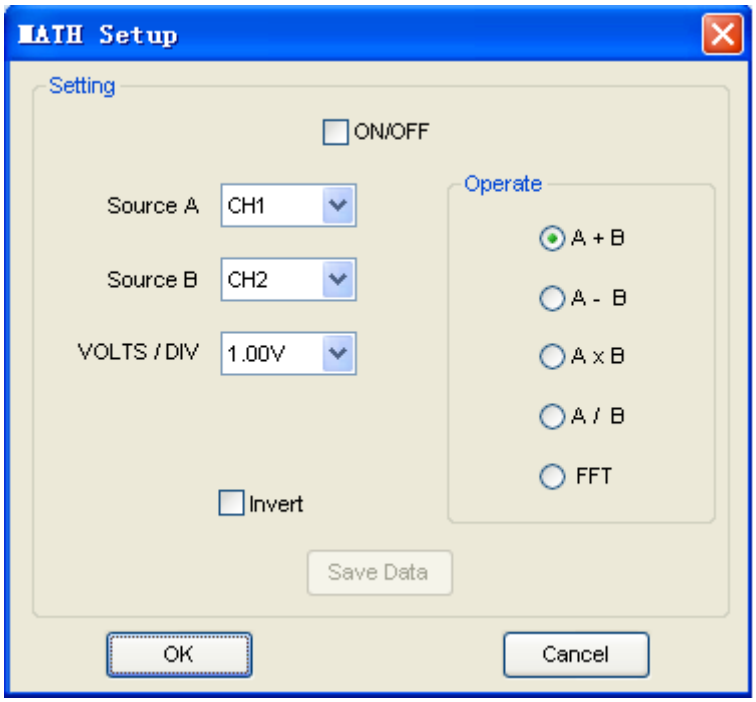
The probe setting window in the sidebar



Note: The attenuation factor changes the vertical scale of the oscilloscope so that the measurement results refect the actual voltage levels at the probe tip.

Set Math

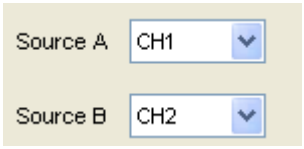
Click **"MATH"** in **Channel** menu to set **MATH** channel.
The **MATH Setup** window:



ON/OFF: Turn On/Off the MATH Channel.
Source A/B: Set the sources of the math channel.
Operate: Set operates type of the math channel.
Volt/DIV: Set the resolution of the math channel.
Probe: Set the math channel probe attenuation.
Invert: Turn on/off the invert function
The mathematic functions include addition, subtract, multiply, division and FFT.

Source A/B

Source A and Source B Menu



Operate

Four Types:

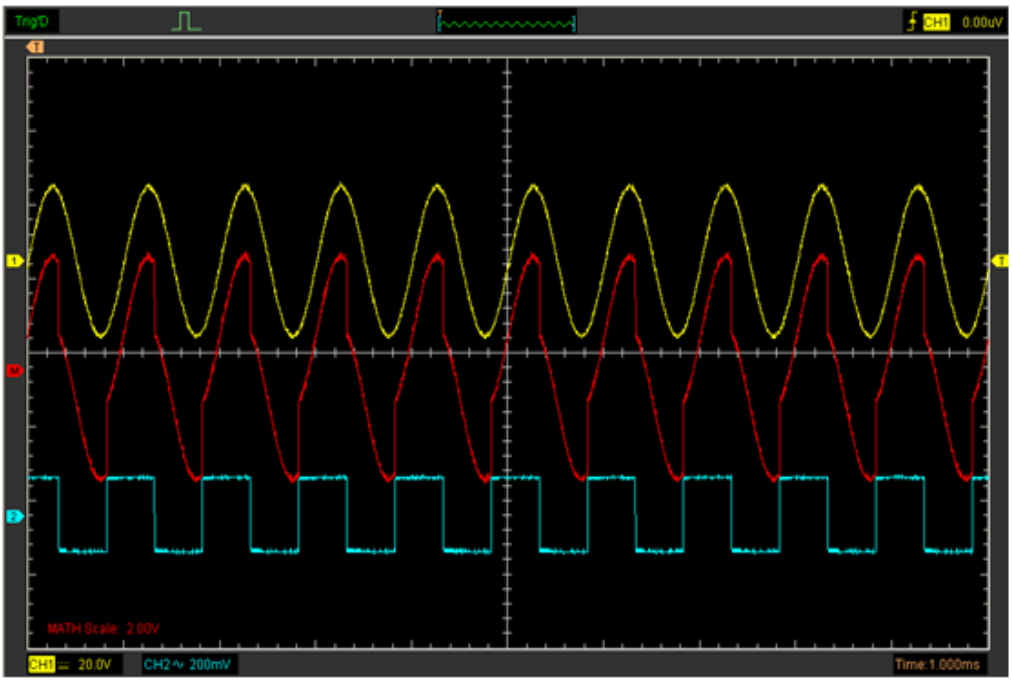
A + B	Add source A and source B
A - B	Subtract source B from source A
A x B	Multiply source A by source B
A / B	Divide source A by source B
FFT	Convert a time-domain signal into its frequency components (spectrum).

In this function, use the addition, subtraction, multiplication and FFT function to operate and analyze the waveform.

Select the operate type in the **Operate** menu. Select source A and B. Then adjust the vertical scale

and offset to view the math channel clearly. The mathematic result can be measured by the measure and the cursor.

The Math Function Display

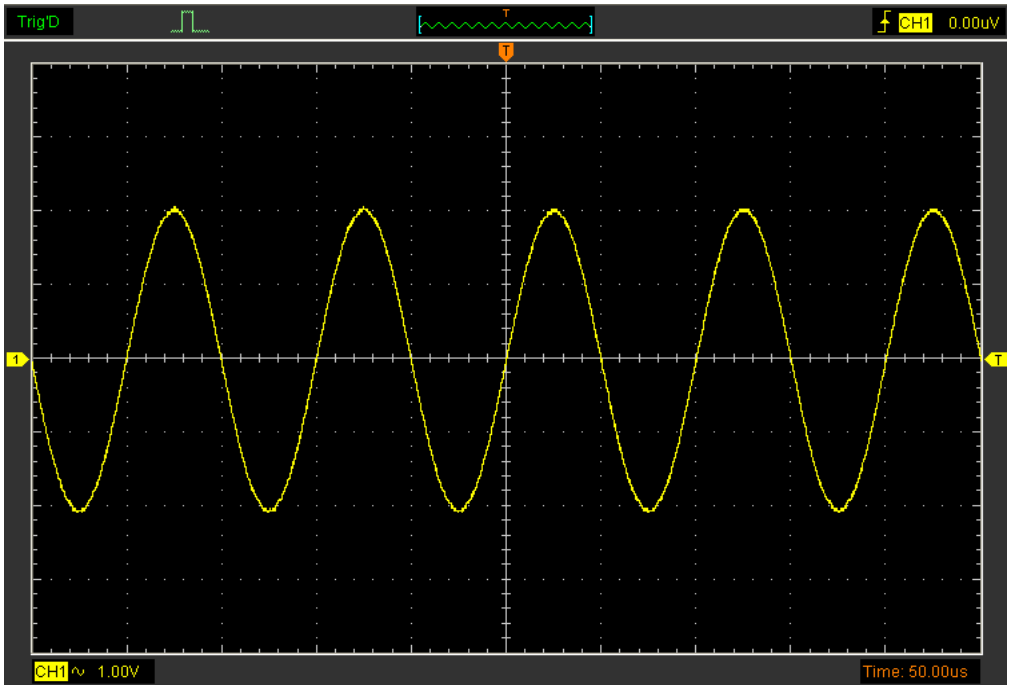


Invert

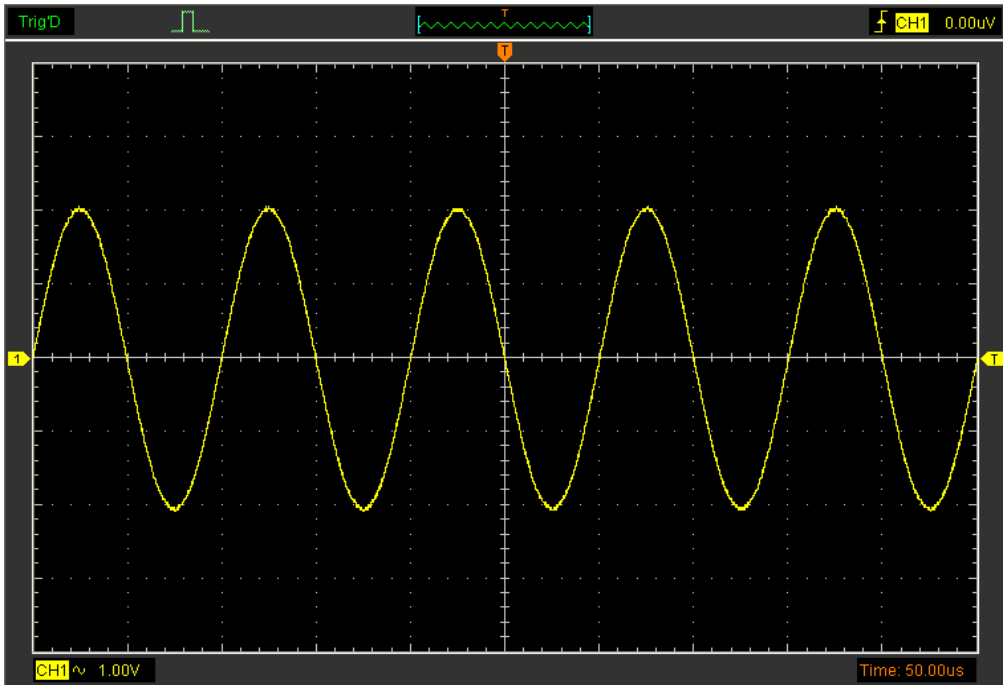
The invert function turns the displayed waveform 180 degrees, with respect to the ground level. When the oscilloscope is triggered on the inverted signal, the trigger is also inverted.

Click **"Invert"** in MATH.

The following picture shows the waveform before inversion:

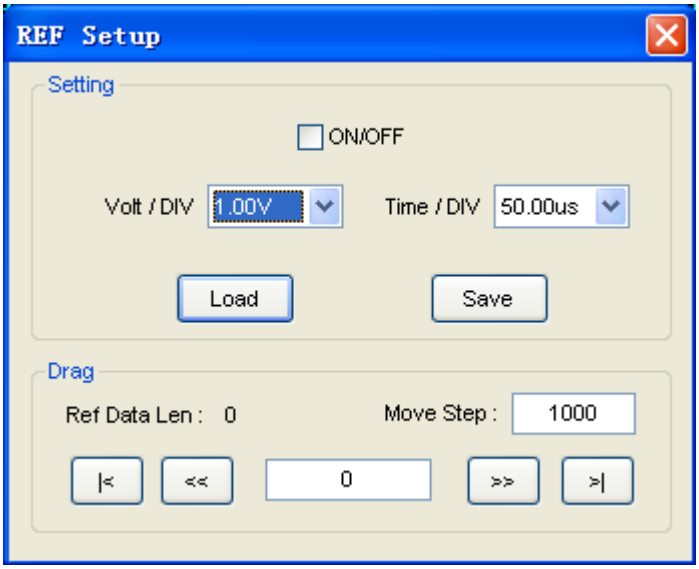


The following picture shows the waveform of inversion:



Set Reference

Click **"REF"** in **"Setup"** menu to set REF channel.



The Reference Channel Function:

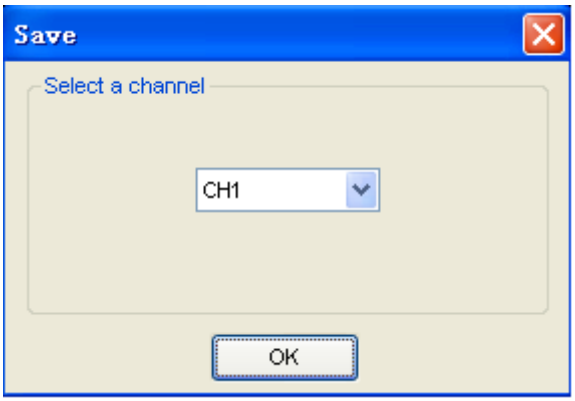
On/Off: Turn on/off the reference channel.
Volt/DIV: Channel the resolution of the reference channel.
Load: Load the reference waveform from the ".rfc" file from your computer.
Save: Save the current reference waveform to your computer as ".rfc" format.
Save Reference: Save the current reference waveform to your computer as "rfc" format.
You can change the vertical scale of a waveform. The waveform display will contract or expand relative to the reference level.

Load

Click **"Load"** to load the "*.rfc" file that was selected. The load file window will appear.

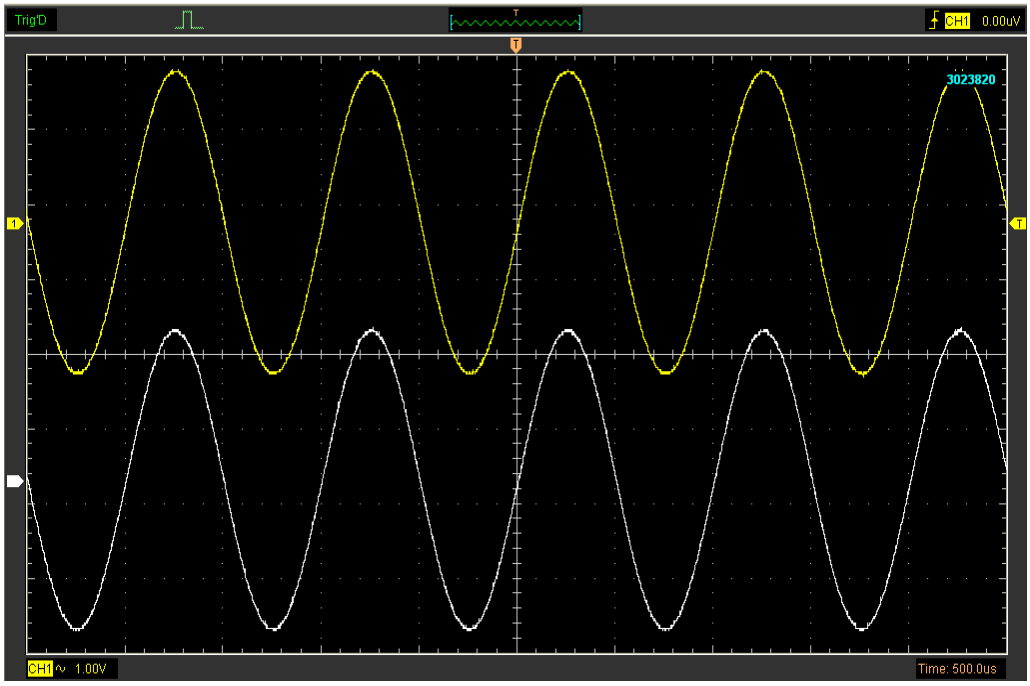
Save

Click **"Save"** to save the waveform to *.rfc file. The saved source window appears.



The save file window will appear after you selected the saved source.

The Reference Waveform Display Window:



Note: If you turn on the "Reference" channel, the load file window will appear.

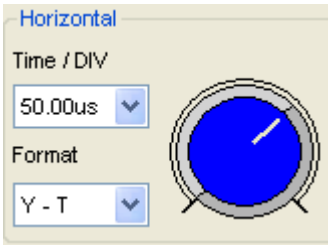
3.3 Setup Horizontal System

Change Time/Div

The **"Time/Div"**

Selects the horizontal **Time/DIV** (scale factor) for the main or the window time base

The Horizontal Panel



Click the blue knob can change **Time/Div**.

If the waveform acquisition is stopped, **Time/Div** control expands or compresses the waveform.

Change Format

Click **"Time/Div"** you can set the Time base in Horizontal Setup window.

In the **"Format"** item, set the waveform display format (**Y-T**, **X-Y**).

Y -T: Show the relative relation between vertical voltage and horizontal time

X -Y: Show CH1 value at X axis; CH2 value at Y axis

Change Horizontal Position

Double click the channel button to set the trigger point to the horizontal center of the screen.

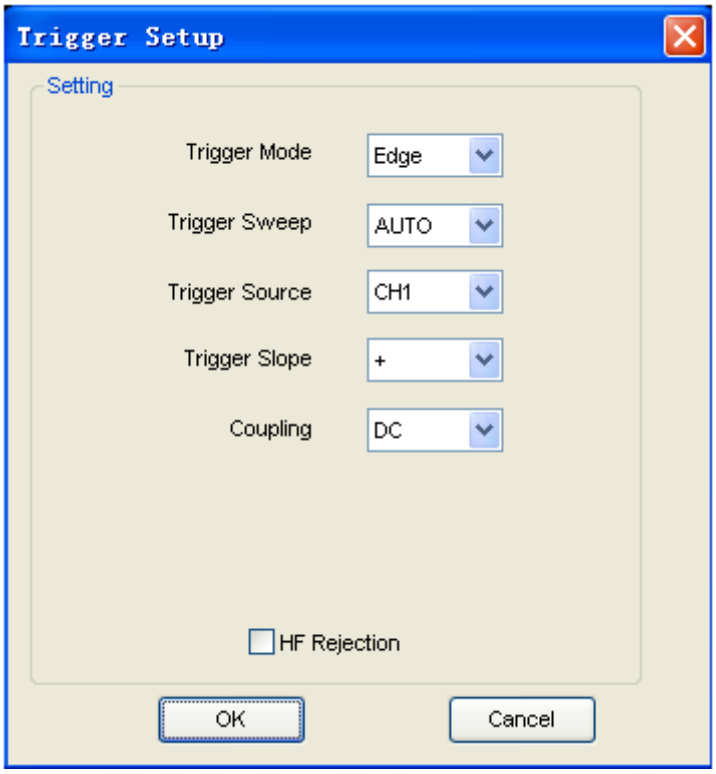
Horizontal position changes the displayed waveform position, relative to the trigger point.

The user can drag on screen to change the horizontal position.

3.4 Set Trigger System

Click **"Setup->Trigger"**, you can configure the trigger.

The user can also click in the toolbar to set Trigger.

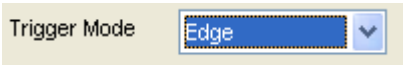


Edge Trigger

The trigger determines when the oscilloscope starts to acquire data and display a wave- form. When a trigger is set up properly, it can convert unstable displays or blank screens into meaningful waveforms. If the oscilloscope wants to acquire a waveform, it collects enough data so that it can draw the waveform to the left of the trigger point. The oscilloscope continues to acquire data while waiting for the trigger condition to occur. The oscilloscope continues to acquire enough data so that it can draw the waveform to the right of the trigger point after it detects a trigger.

The **Edge** trigger determines whether the oscilloscope finds the trigger point on the rising or the falling edge of a signal. Select **Edge** trigger mode to trigger on **Rising** edge or **Falling** edge.

Mode: Select the trigger mode.



Sweep: Set the sweep mode to **Auto**, **Normal** or **Single**.

Auto: Acquire waveform even no trigger occurred
Normal: Acquire waveform when trigger occurred.
Single: Acquire waveform when trigger occurred then stop

Source: You can use the trigger source options to select the signal that the oscilloscope uses as a

trigger. The source can be any signal connected to a channel BNC, or to the EXT. BNC.

CH1: Select CH1 as trigger signal
CH2: Select CH2 as trigger signal
EXT.: Select EXT as trigger signal
EXT/5: Select EXT/5 as trigger signal

Slope: Set the slope to **Rising (+)** or **Falling (-)**.

Rising: Trigger on rising edge
Falling: Trigger on falling edge

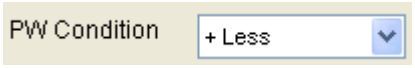
Set Pulse Trigger

Pulse trigger occurs according to the width of pulse. The abnormal signals can be detected through setting up the pulse width condition.

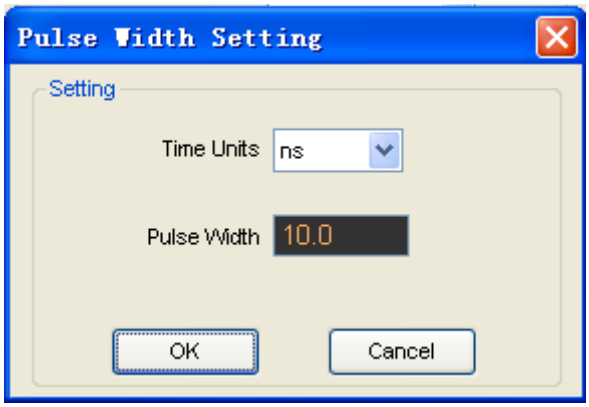
Mode:

Sweep:

Source:

PW Condition: 

Pulse Width: The Pulse Width adjust range is 10ns~10s. When the condition is met, it will trigger and acquire the waveform.



When alternative trigger is on, the trigger sources come from two vertical channels. This mode can be used to observe two non-related signals. You can choose two different trigger modes for the four vertical channels.

Options	Settings	Comments
Pulse		With Pulse highlighted, the trigger occurs on pulses that meet the trigger condition (defined by the Source, When and Set Pulse Width options).
Sweep	Auto, Normal, Single	Auto: Acquire waveform even no trigger occurred Normal: Acquire waveform when trigger occurred Single: Acquire waveform when trigger occurred then stop.
Source	CH1 CH2 EXT EXT/5	Select the input source as the trigger signal.
Pulse Width		Set Pulse Width highlighted, including **Time Unit** and **Pulse Width**
Coupling	AC DC	Selects the components of the trigger signal applied to the trigger circuitry.
Polarity	Positive Negative	Select to trigger on positive or negative pulses.
PW Condition	Equal Not Equal Less More	Equal: Pulse width equal than selecting pulse condition. Not Equal: Pulse width not equal to selected pulse condition. Less: Pulse width less than selecting pulse condition. More: Pulse width more than selecting pulse condition.

Video Trigger:

Options	Settings	Comments
Video		With Video highlighted, an NTSC, PAL or SECAM standard video signal will be triggered. The trigger coupling is preset to AC.
Sweep	Auto, Normal Single	Auto: Acquire waveform even no trigger occurred Normal: Acquire waveform when trigger occurred Single: Acquire waveform when trigger occurred then stop.
Source	CH1 CH2 EXT. EXT/5	Select the input source as the trigger signal. Ext use the signal applied to the EXT TRIG connector as the source.
Standard	NTSC PAL/SECAM	Choose a video standard for sync and line number count.
Polarity	Positive Negative	Select to trigger on positive or negative pulses.
Sync	All Lines Line Number Odd Field Even Field All Fields	Choose a proper video sync. When selecting Line Number for the Sync option, you may use the User Select knob to specify a line number.

Set Alter Trigger:

Options	Settings	Comments
Alter Trigger		
Channel	CH1 CH2	Push an option such as CH1, select the channel trigger type and set the menu interface.
Below list options in submenus. Alter Trigger allows CH1 and CH2 to select different trigger modes and to display waveforms on a same screen. That is, both channels can choose the following four trigger modes.		
Type	Edge	
Slope	Rising Falling	
Coupling	AC DC	Select the components of the trigger signal applied to the trigger circuitry.

Type	Video	
Polarity	Normal Inverted	
Standard	NTSC PAL/SECAM	
Sync	All Lines Line Number Odd Field Even Field All Fields	Select by F4, F5.
Type	Pulse	
Polarity	Positive Negative	
When	= ≠ < >	Select by F3.
Pulse Width	Pulse Width	Push F4 to select. Adjust the multi-functional knob V0 to set the pulse width.
Coupling	AC DC	Select by F5.
Type	O.T.	
Overtime		Click it and pop up a dialog.
Coupling	AC DC	Selects the components of the trigger signal applied to the trigger circuitry.
Polarity	Positive Negative	Select to trigger on positive or negative pulses.

Set Slope Trigger:

Judges trigger according to the time for rising or falling, more flexible and accurate than the Edge trigger.

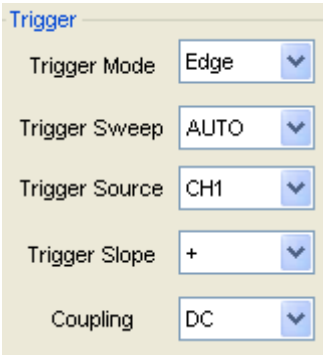
Options	Settings	Comments
Slope		
Sweep	Auto Normal Single	Select the type of trigger. The Normal mode is best for most pulse width trigger applications.
Source	CH1 CH2 EXT EXT/5	Select the input source as the trigger signal.
Time	20ns to 10.0sec	
Coupling	AC DC	Selects the components of the trigger signal applied to the trigger circuitry.
Slope	Rising Falling	Select the slope type of signal.
When	= ≠ < >	Select the trigger condition.

Set Overtime Trigger:

In Pulse Width trigger, you may sometimes be puzzled with the long time for trigger, as you do not need a complete pulse width to trigger the oscilloscope, but want the trigger occurs just upon the overtime point. This is called Overtime Trigger.

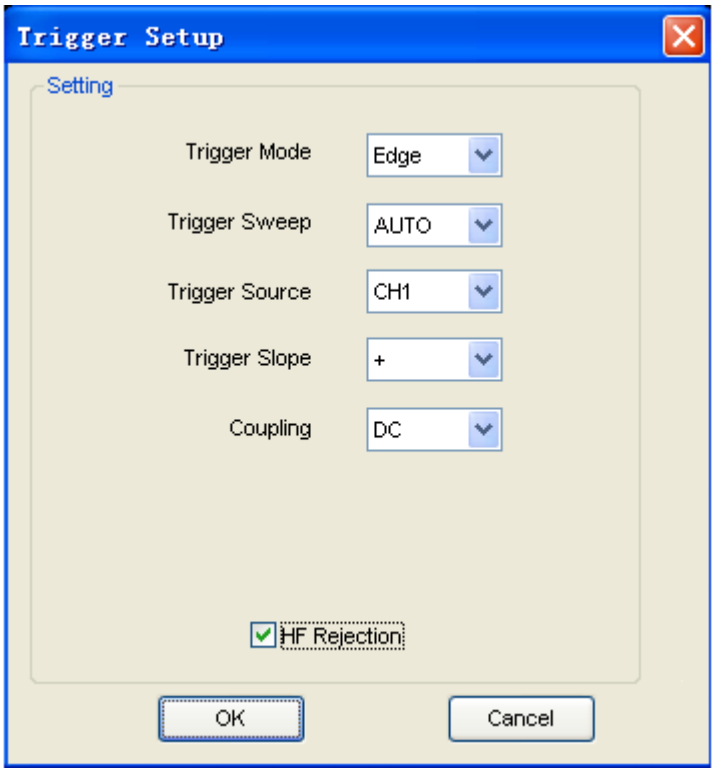
Options	Settings	Comments
O.T.		
Sweep	Auto Normal Single	
Source	CH1 CH2	Select the trigger source.
Overtime		Click it and pop up a dialog.
Coupling	AC DC	Selects the components of the trigger signal applied to the trigger circuitry.
Polarity	Positive Negative	Select to trigger on positive or negative pulses.

The user can also change the trigger setting on trigger panel in sidebar.



High Frequency Rejection

Select **"HF Rejection"** in **"Trigger Setup"** window

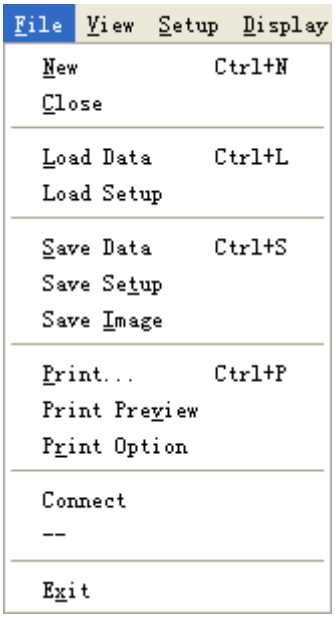


The user can turn on **"HF Rejection"** to eliminate trigger higher-frequency (20M above)

3.5 Save/Load

Save

Click **"File"** in main menu to save waveform, setups and screen.



1. Save Data

Save waveform data as a type file

2. Save Setup

Save the current oscilloscope setup to file

3. Save Image

Save the software display window as a .bmp or .jpg file

Load

Click **"File"** in main menu to recall saved waveform, setup

1. Load Data

Load the waveform that had saved as a type file

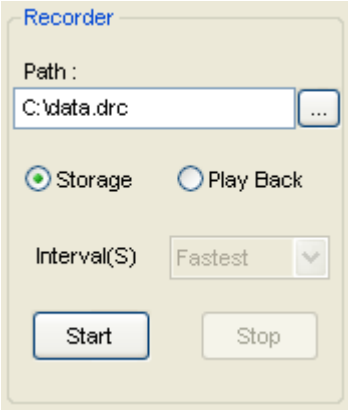
2. Load Setup

Load the instrument that had saved

3.6 Utility Function

3.6.1 Record

The **Record** window displays on right sidebar. The following picture shows the **Record** Interface.



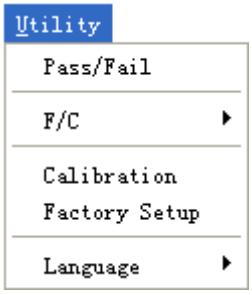
This function can record input waveform form CH1 or CH2.

Storage: Record waveform and save it as ".drc" file. **"Play Back"** button: Click this button to start playing back waveform.

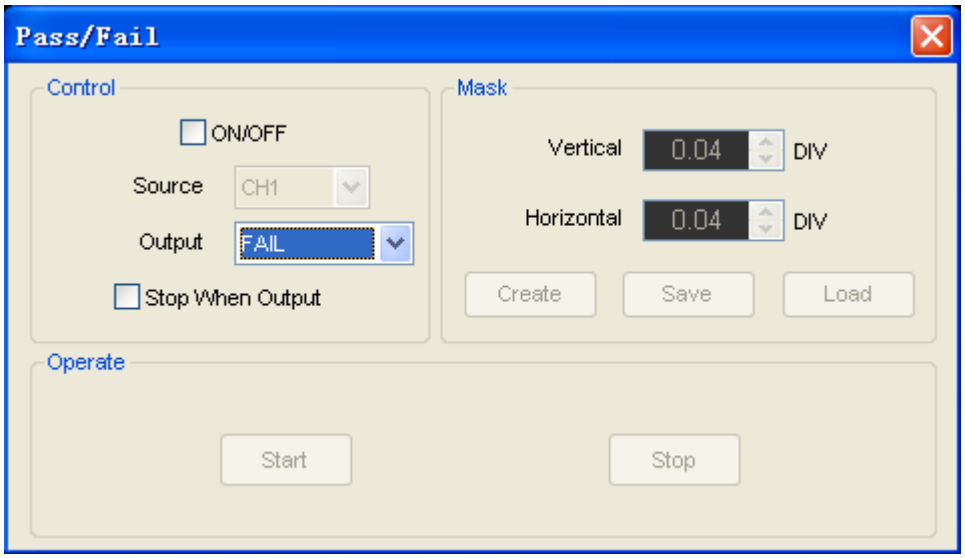
"Start" button: Start to record waveforms. After you start to record waveforms, this window will disappear. Please click "Utility->Record" to open the window again. Click **"Stop"** to stop recording waveforms.

3.6.2 Pass/Fail

Click **"Pass/Fail"** in **"Utility"** menu.

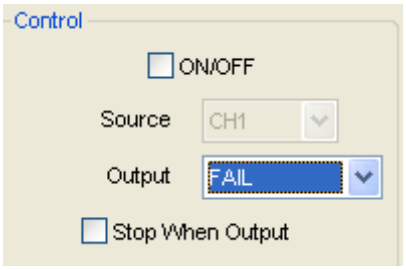


The **Pass/Fail** window appears:

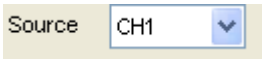


The **Pass/Fail** function monitors changes of signals and outputs pass or fail signals by comparing the input signal with the pre-created mask.

Control Setting



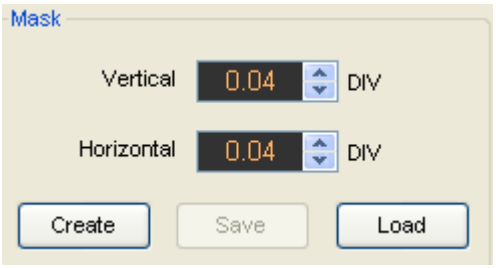
Source: Select the **Pass/Fail** channel



Output: Select the **Pass/Fail** output condition.

Stop When Output: If it was checked, the Pass/Fail will stop when output.

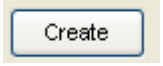
Mask Setting



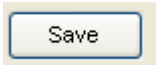
Vertical: Set the vertical limit range

Horizontal: Set the horizontal limit range

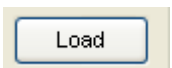
"Create" button: Click this button to create Pass/Fail area according to the mask



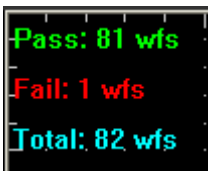
"Save" button: Click this button to save the setups to file



"Load" button: Click this button to load the saved setups file



Information Display

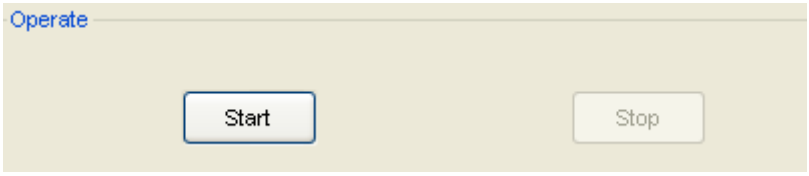


Fail: It shows the fail waveform number

Pass: It shows the pass waveform number

Total: It shows the l total **Pass/Fail** waveform number

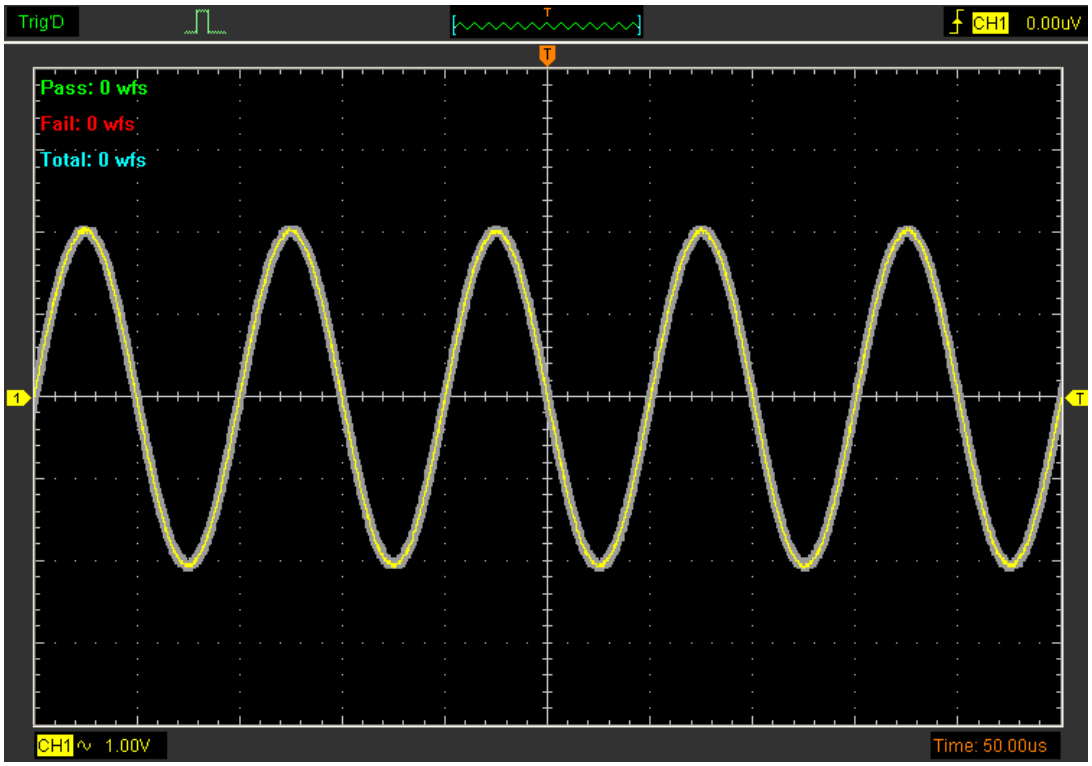
Operation



Click **"Start"** button to start the **Pass/Fail** test.

Click **"Stop"** button to stop the **Pass/Fail** test.

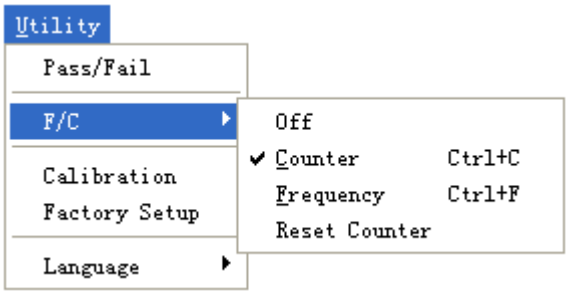
The Pass/Fail function display



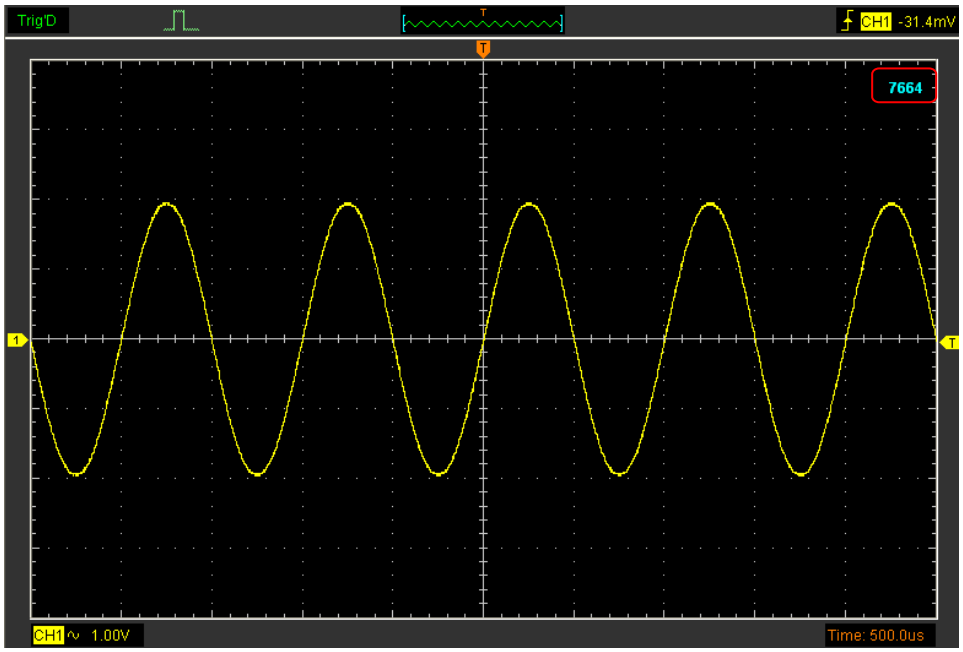
NOTE: **Pass/Fail** function is unavailable in **X-Y** mode.

3.6.3 Frequency/Counter

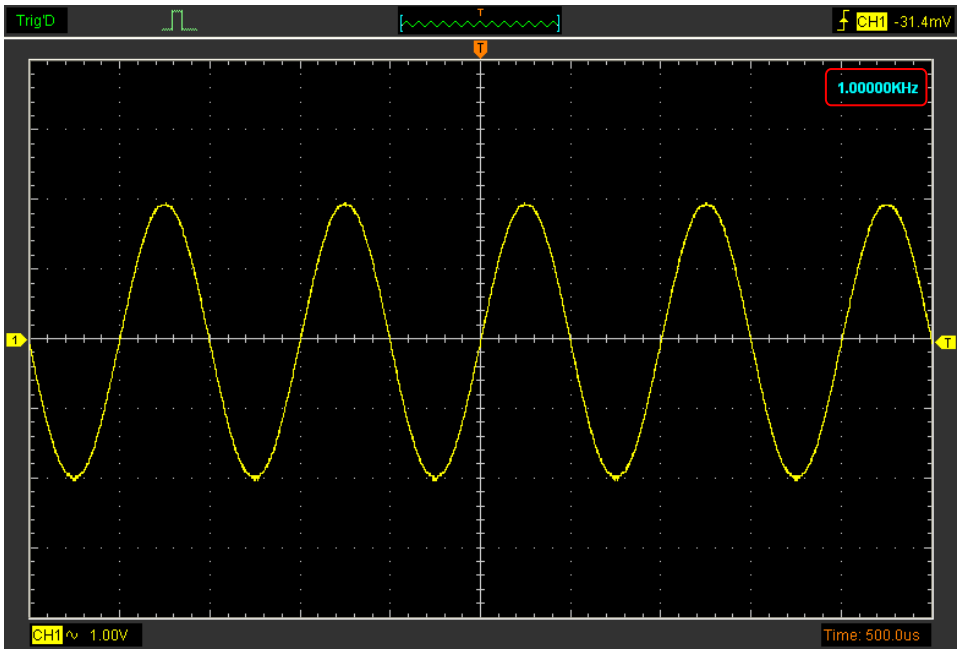
Click **“F/C”** in **UNTILITY** menu.



Counter: Record the number of a waveform.

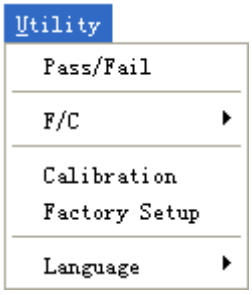


Frequency: Measure the frequency of a waveform.



3.6.4 Factory Setup

Click **"Factory Setup"** in **"Utility"** menu to load default setups



When you click the **Factory Setup** in **Utility** menu, the oscilloscope displays the CH1/CH2 waveform and removes all other waveforms.

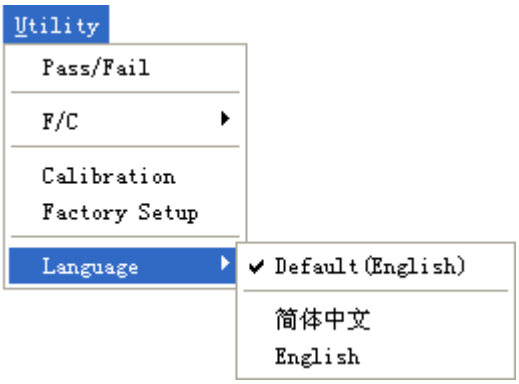
The oscilloscope set up for normal operation when it is shipped from the factory and can be recalled at anytime by user.

The Factory Setup function does not reset the following settings:

◆ Language option
◆ Date and time

3.6.5 Language

Click **"Language"** in **"Utility"** menu.

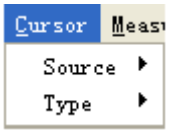


There are four languages in **"Language"** menu. The default language is English.

3.7 Measure Signal

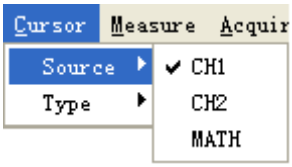
3.7.1 Cursor Menu

Click **"Cursor"** in main menu.



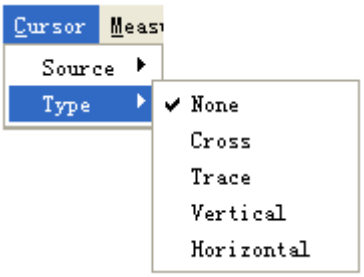
This method allows you to take measurements by moving the cursors

1. Source



The user can set the source to **CH1**, **CH2** and **MATH**.
When you use cursors, be sure to set the **Source** to the waveform on the display that you want to measure.

2. Type

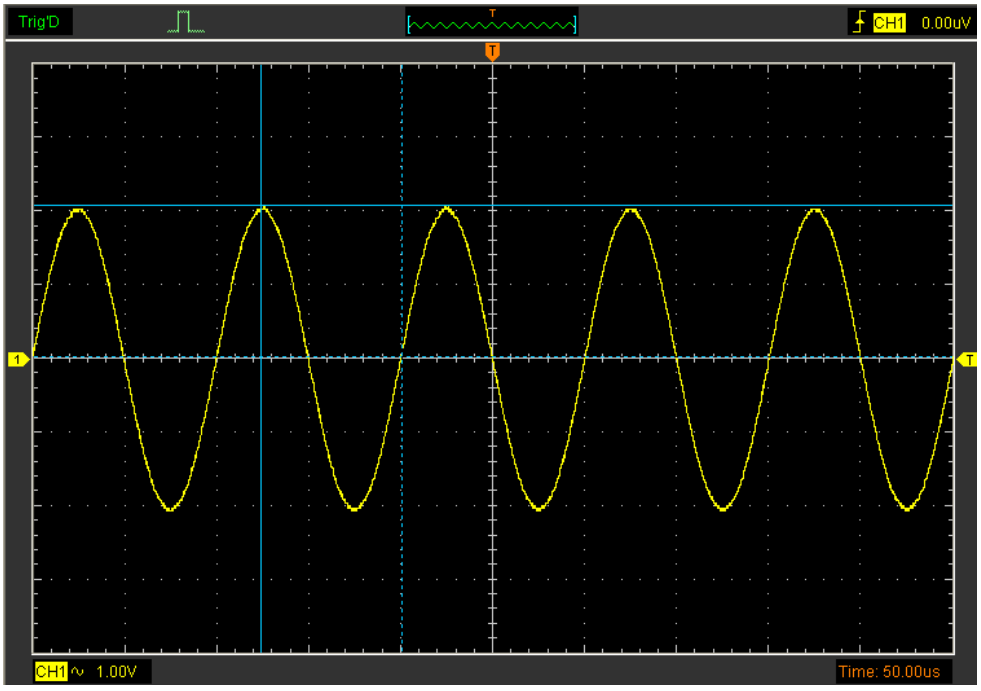


There are four types of cursors: **Cross**, **Trace**, **Vertical** and **Horizontal**

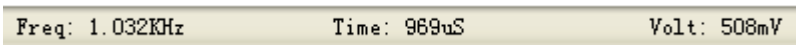
1) Cross

The **Cross** cursors appear as cross lines on the display and measure the vertical and horizontal parameters.

The **Cross** cursor display window:



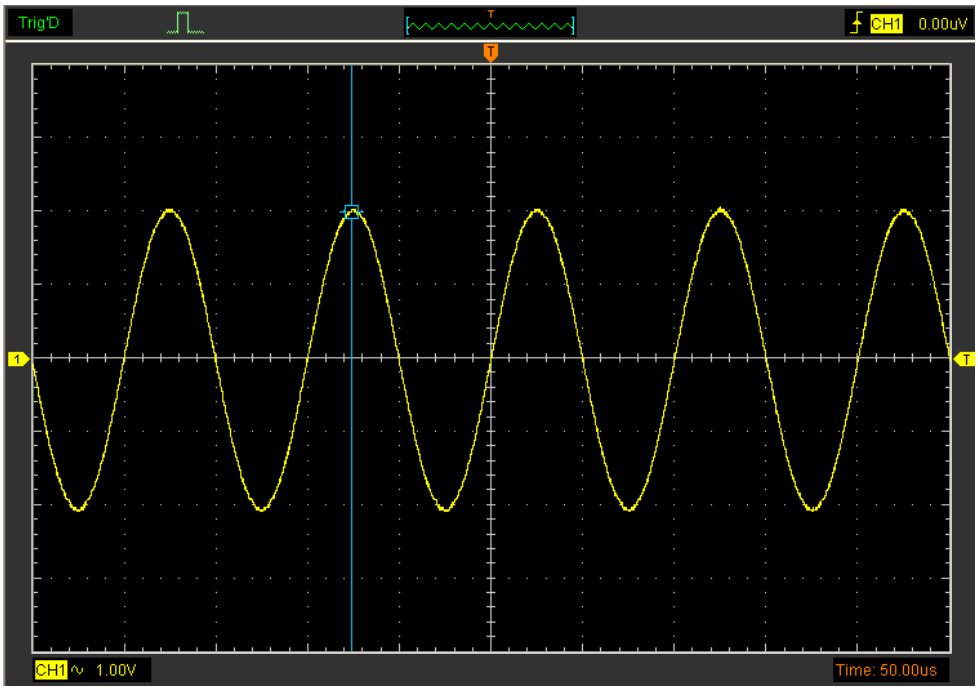
The **Cross** measure result displays on status bar



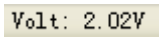
2)Trace

The **Trace** cursors appear as vertical lines on the display and measure the waveform amplitude at the point the waveform crosses the cursor.

The **Trace** cursor display window:



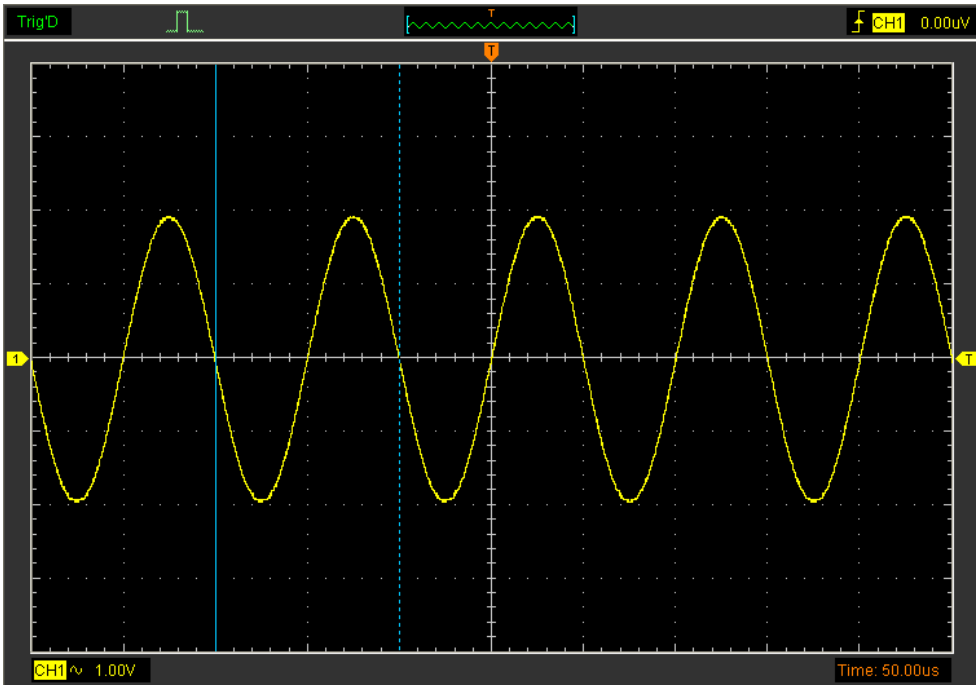
Read the details showing in the status bar.



3)Vertical

The **Vertical** cursors appear as vertical lines on the display and measure the vertical parameters.

The **Vertical** cursor display window:

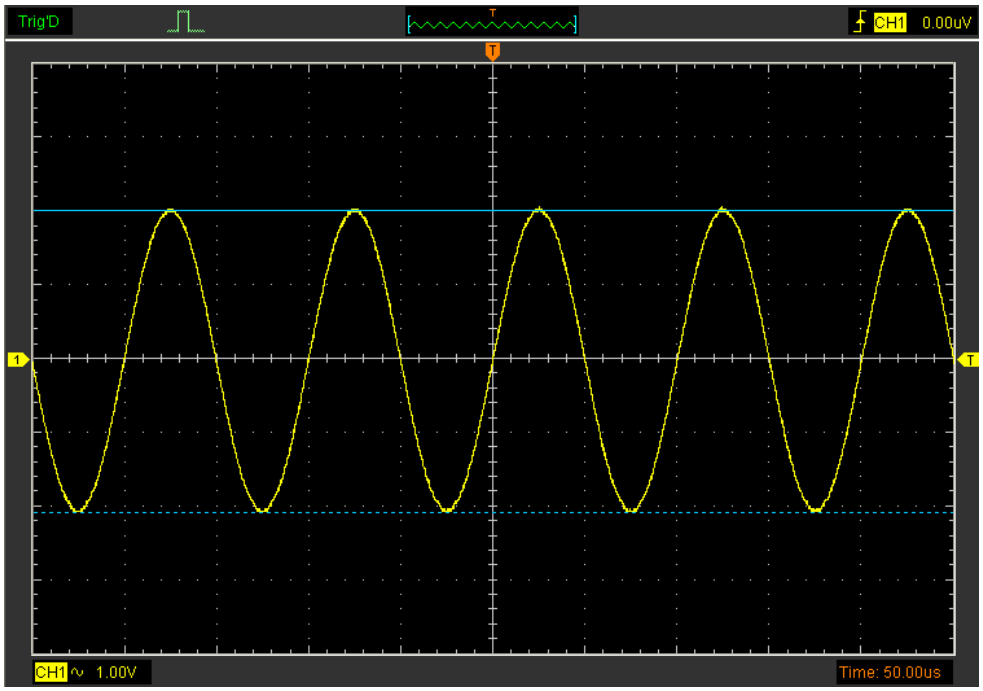


Read the details showing in the status bar.

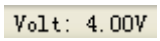
4)Horizontal

The **Horizontal** cursors appear as horizontal lines on the display and measure the horizontal parameters.

The **Horizontal** cursor display window:



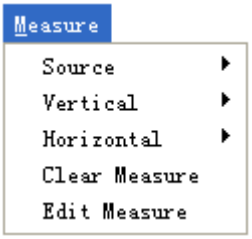
Read the details showing in the status bar.



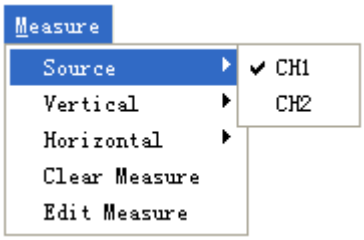
3.7.2 Measure Menu

Click **"Measure"** in main menu.

The oscilloscope provides 20 parametric auto measurements (12 voltage and 8 time measurements).

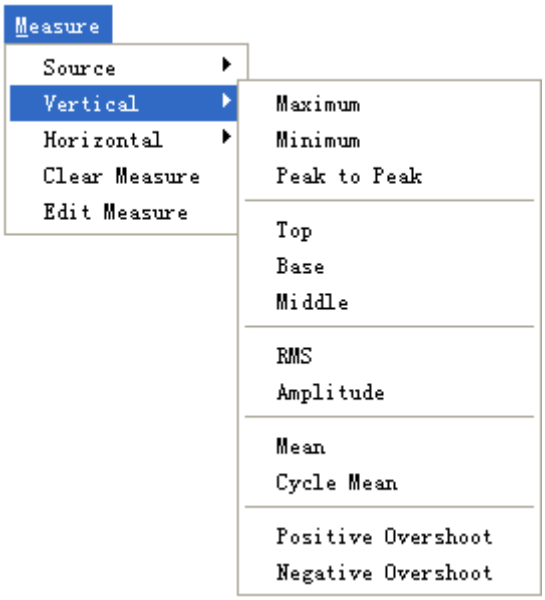


1.Source



The user can use the **"Source"** menu to select a measure source.

2. Vertical



Maximum: Voltage of the absolute maximum level, Measured over the entire waveform

Minimum: Voltage of the absolute minimum level, Measured over the entire waveform

Peak To Peak: Peak-to-peak = Max –Min, Measured over the entire waveform

Top: Voltage of the statistical maximum level, Measured over the entire waveform

Base: Voltage of the statistical minimum level, Measured over the entire waveform

Middle: Voltage of the 50% level from base to top

RMS: The Root Mean Square voltage over the entire waveform

Amplitude: Amp = Base - Top, Measured over the entire waveform

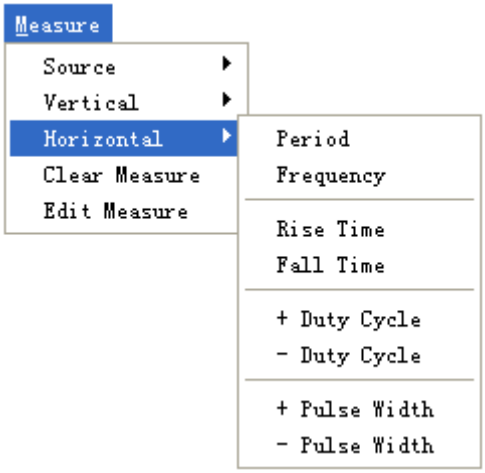
Mean: The arithmetic mean over the entire waveform

Cycle Mean: The arithmetic mean over the first cycle in the waveform

Preshoot: Positive Overshoot = (Max - Top)/Amp x 100 %, Measured over the entire waveform

Overshoot: Negative Overshoot = (Base - Min)/Amp x 100 %, Measured over the entire waveform.

3.Horizontal

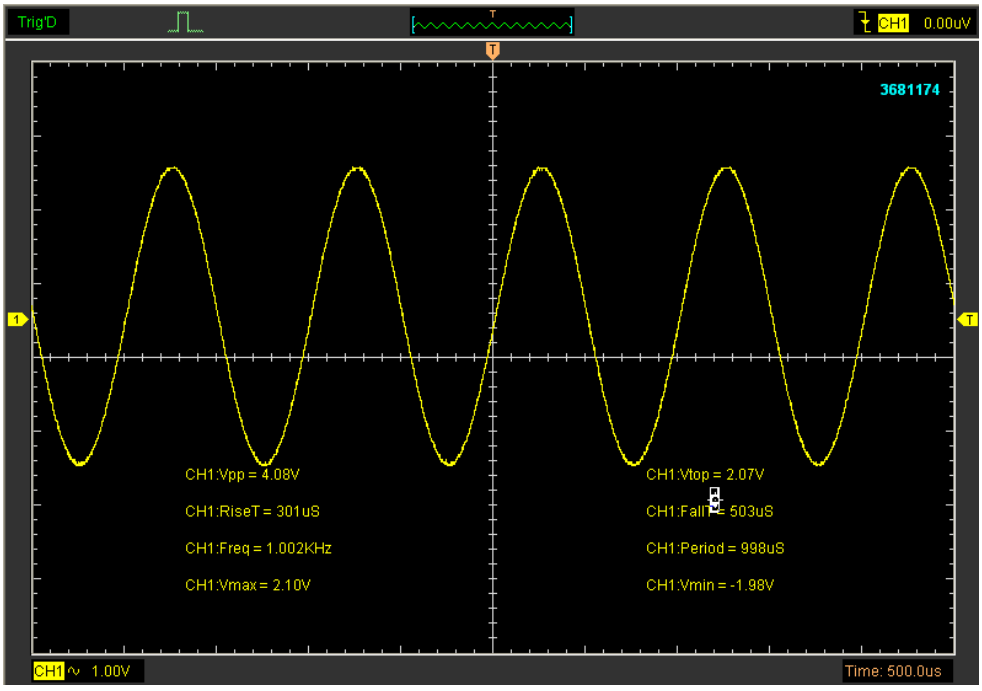


Period: Time to take for the first signal cycle to complete in the waveform
Frequency: Reciprocal of the period of the first cycle to complete in the waveform
Rise Time: Time taken from lower threshold to upper threshold
Fall Time: Time taken from upper threshold to lower threshold
+Duty Cycle: Positive Duty Cycle = (Positive Pulse Width)/Period x 100%, Measured of the first cycle in waveform.
-Duty Cycle: Negative Duty Cycle = (Negative Pulse Width)/Period x 100%, Measured of the first waveform.
+Pulse Width: Measured of the first positive pulse in the waveform. The time between the 50% amplitude points
-Pulse Width: Measured of the first negative pulse in the waveform. The time between the 50% amplitude points

4. Clear Measure

Clear all measure items on display screen.

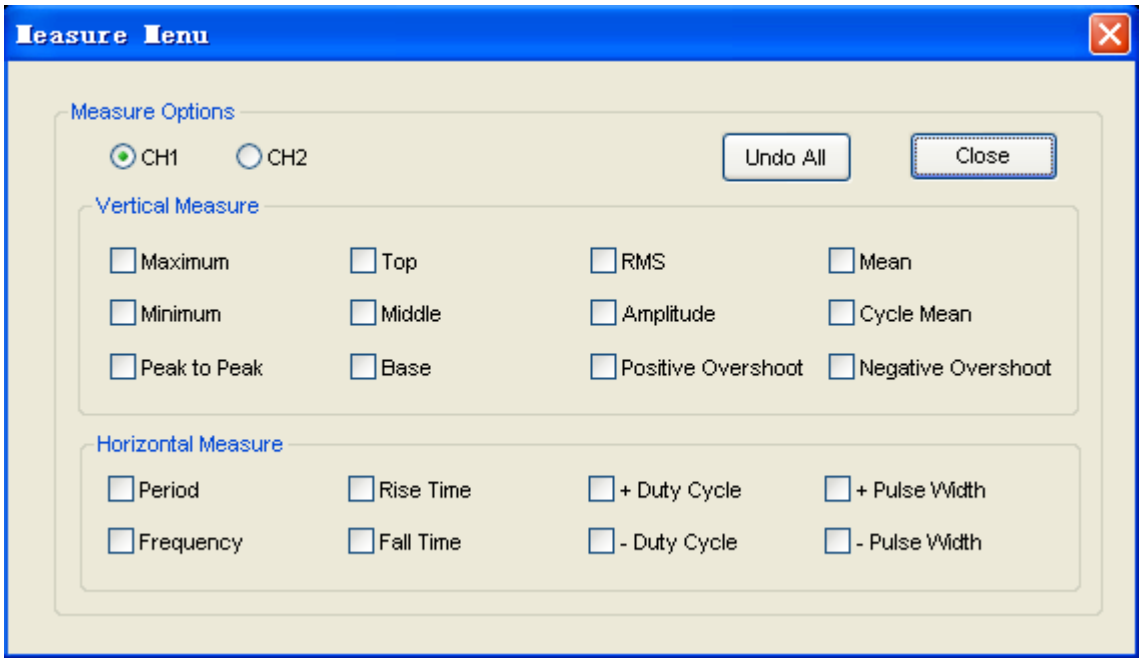
The **Measure** Display Window:



Note: The results of the automatic measurements will be displayed on the bottom of the screen. Maximum 8 results could be displayed at the same time. When there is no room, the next new measurement result will make the previous results moving left, out of screen.

5. Edit Measure

Click "**Measure->Edit Measure**".



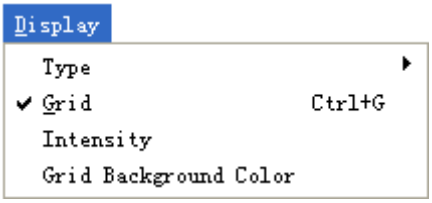
User can select Maximum 8 measure options to measure.

3.8 The Display System

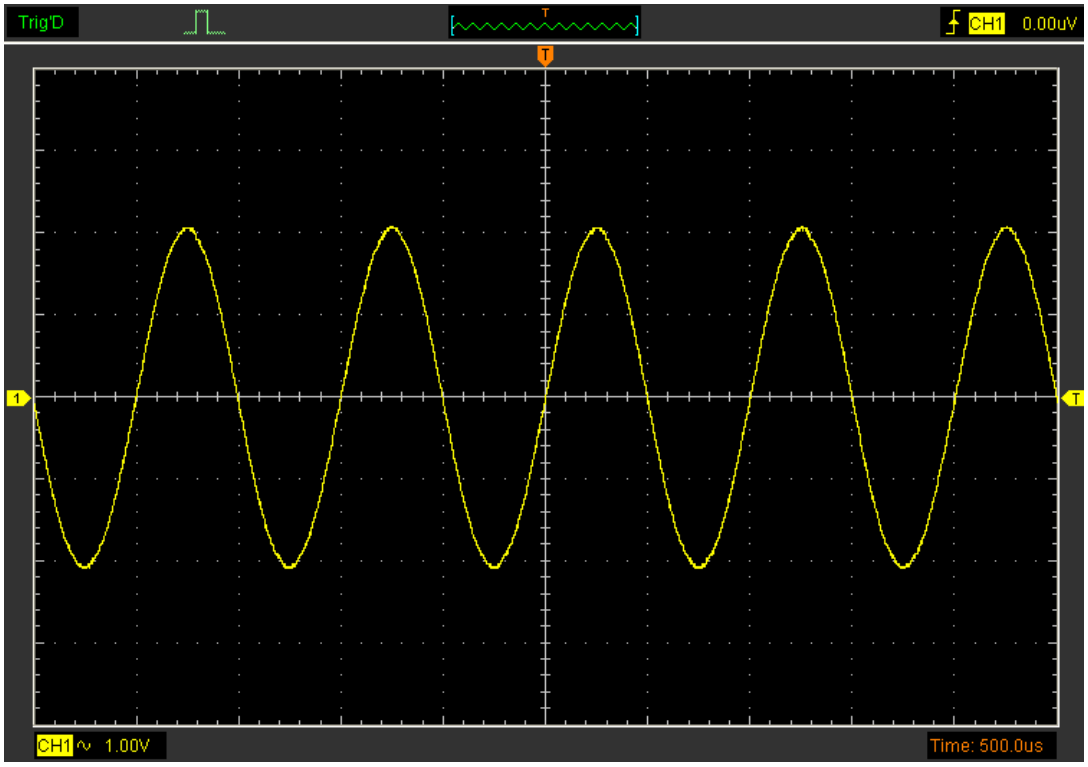
3.8.1 Display Type

Click **"Type"** in **"Display"** menu.

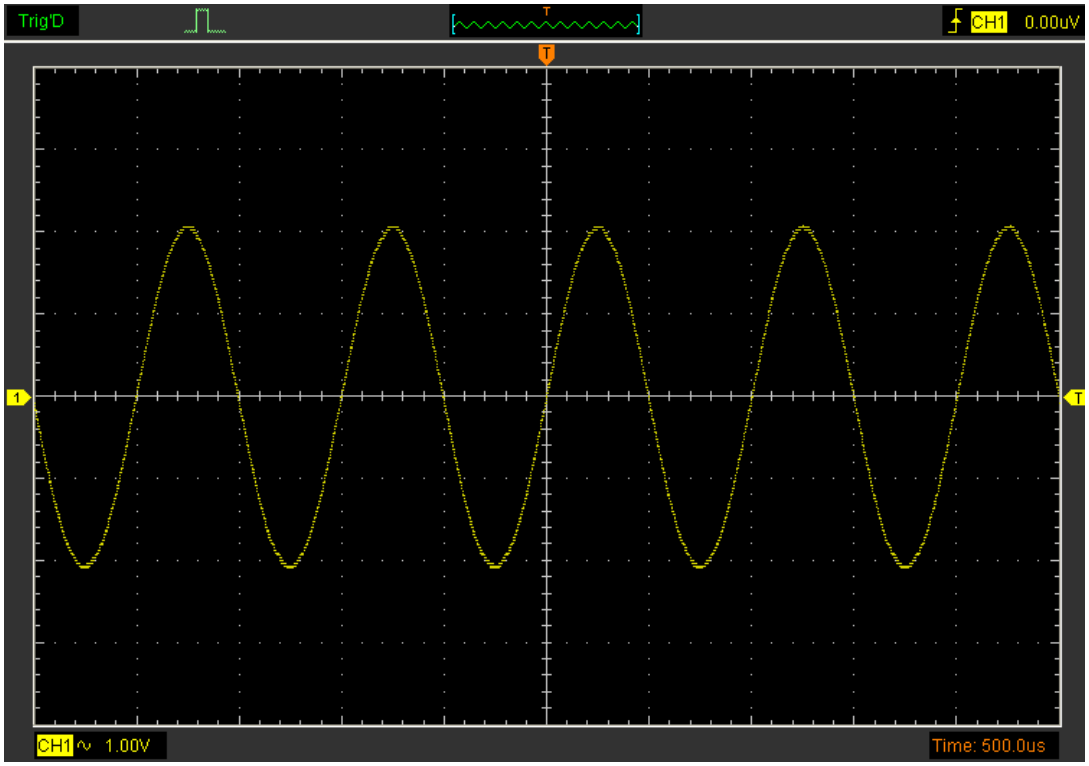
The following figure shows the type parameters setting.



If the **Vectors** type mode is selected, the waveform will be displayed as following figure.

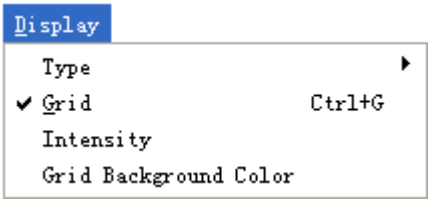


If the **Dots** type mode is selected, the waveform will be displayed as following figure.

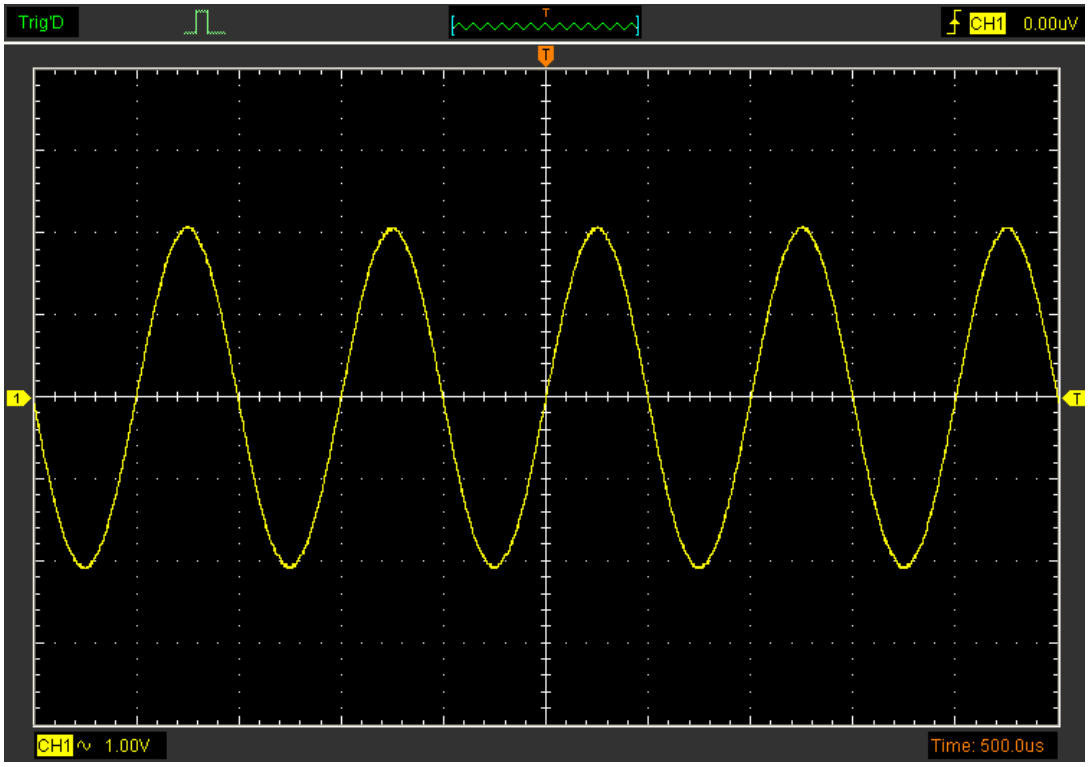


3.8.2 Display Grid

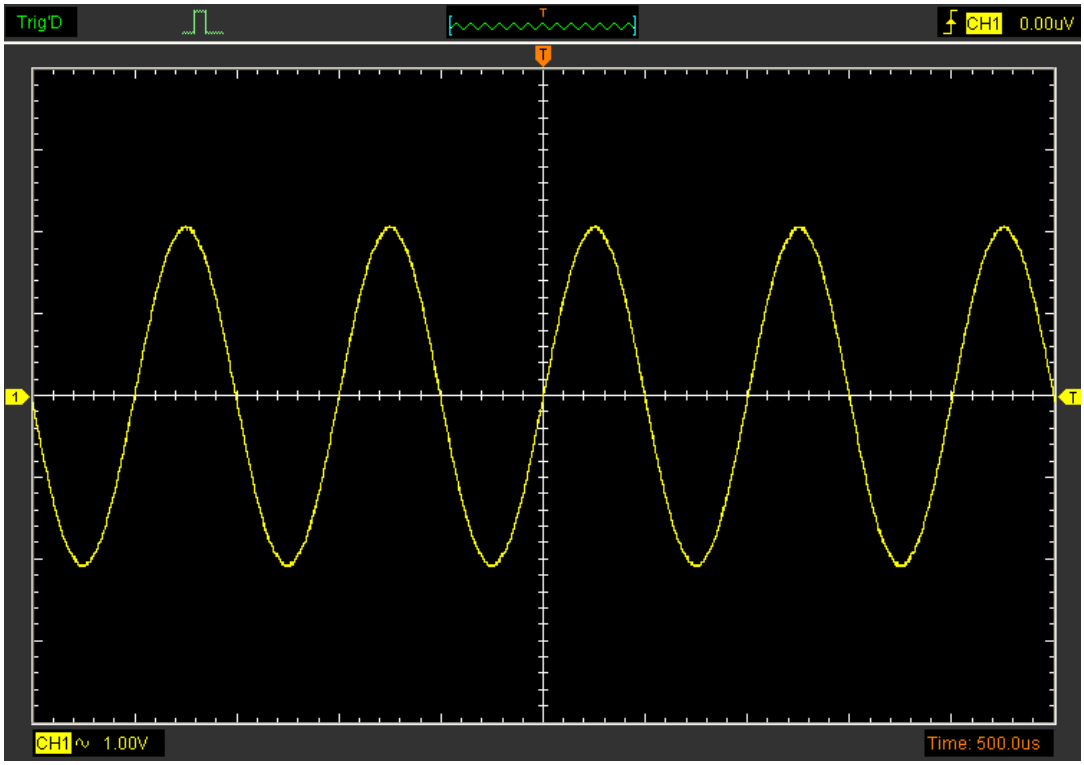
Click **“Display”** in main menu.



The grid shows:

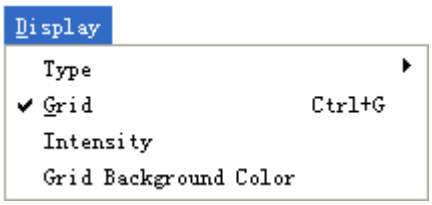


The grid not shows:

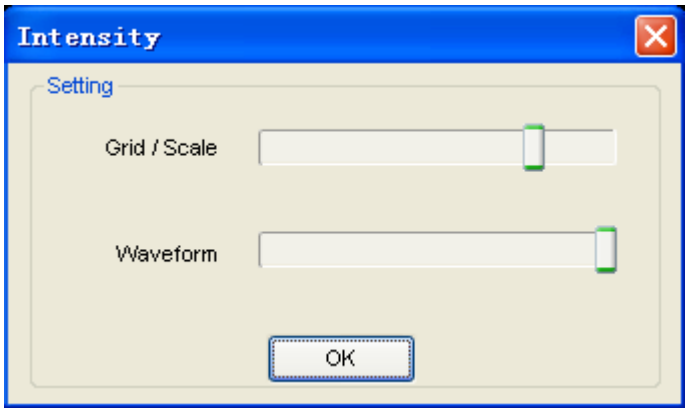


3.8.3 Intensity

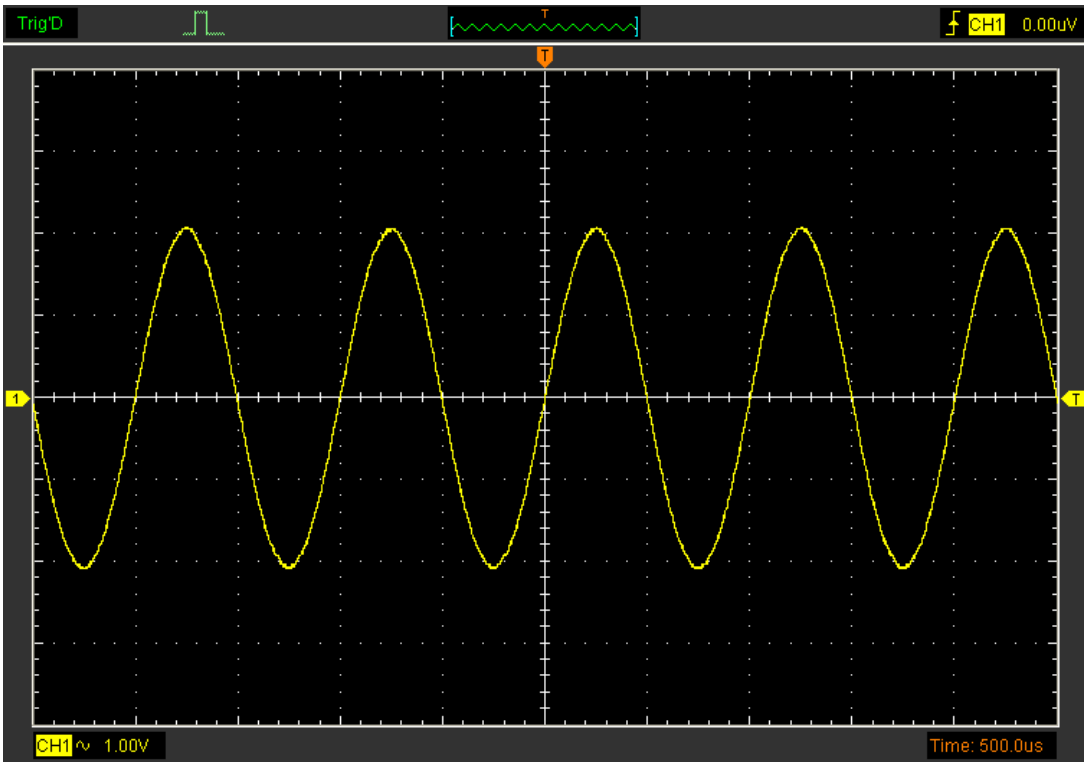
Click **"Display->Intensity"** in main menu.



The following figure shows the intensity dialog. It shows the display parameters setting.

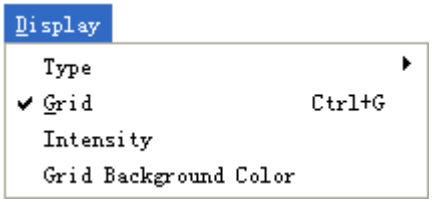


You can change the grid and waveform color intensity in this dialog.

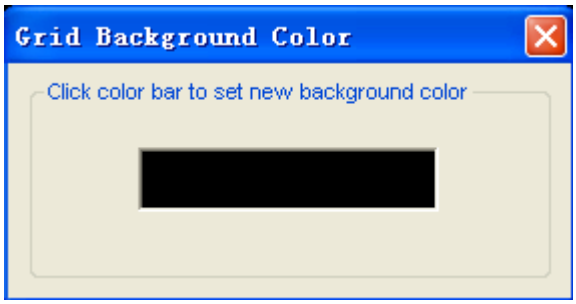


3.8.4 Grid Background Color

Click **"Display->Grid Background Color"** in main menu.

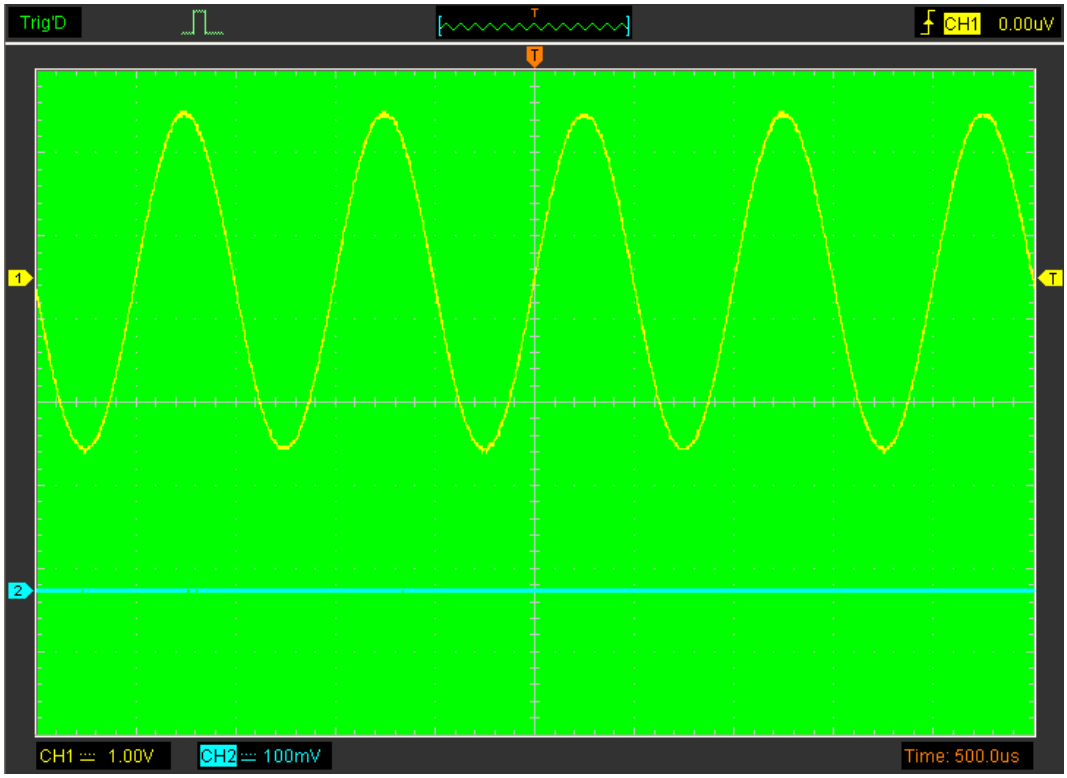


The following figure shows Grid Background Color dialog. It shows the background color setting.



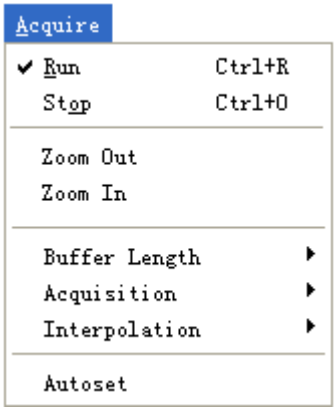
If you click the color rectangle, the color dialog will be showed:

The background color was changed:



3.9 Zoom In/Out and Drag Waveforms

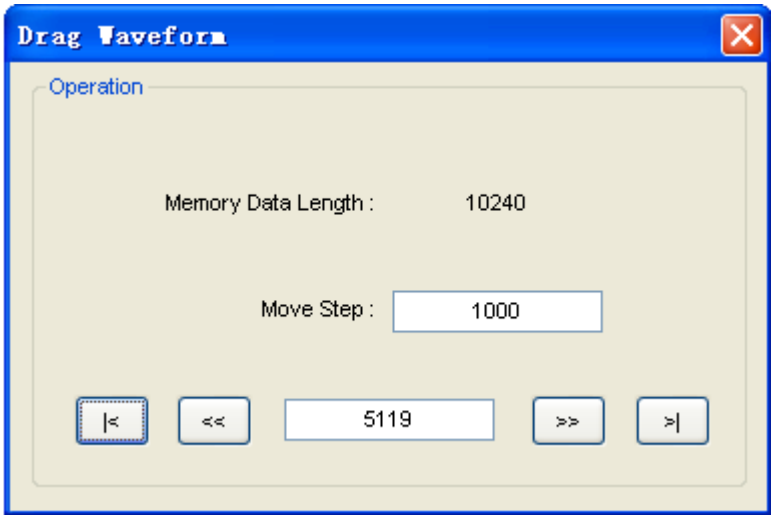
The software will stop updating waveform after the user clicked **"Stop"** button.
The user can change the waveform display by adjusting the scale and position. When you change the scale, the waveform display will increase or decrease in size. When you change the position, the waveform will move up, down, right, or left.
The channel reference indicator identifies each waveform on the display. The indicator points to the reference level of the waveform record.



Zoom In/Out
The user can click **"Zoom In/Out"** in **"Acquire"** menu, then left or right click the mouse button on display screen to **zoom in/out** the waveform. Also the user can change **Time/Div** in **Horizontal** menu or in **Horizontal** panel to zoom in/out the waveform.

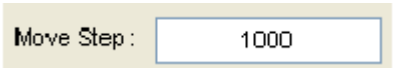
Drag

Click button on toolbar to stop acquire waveform. Then clicked on toolbar to modify the waveform position as the following steps.

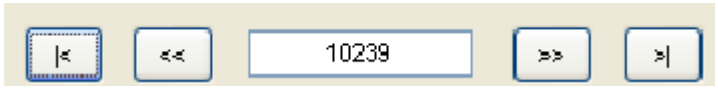


1.Select Channel:

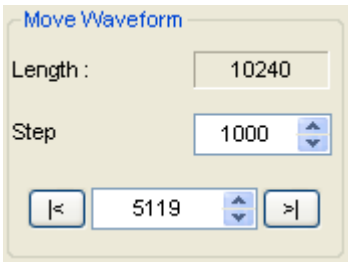
2.Set the Move Step:



3.Change the waveform position:



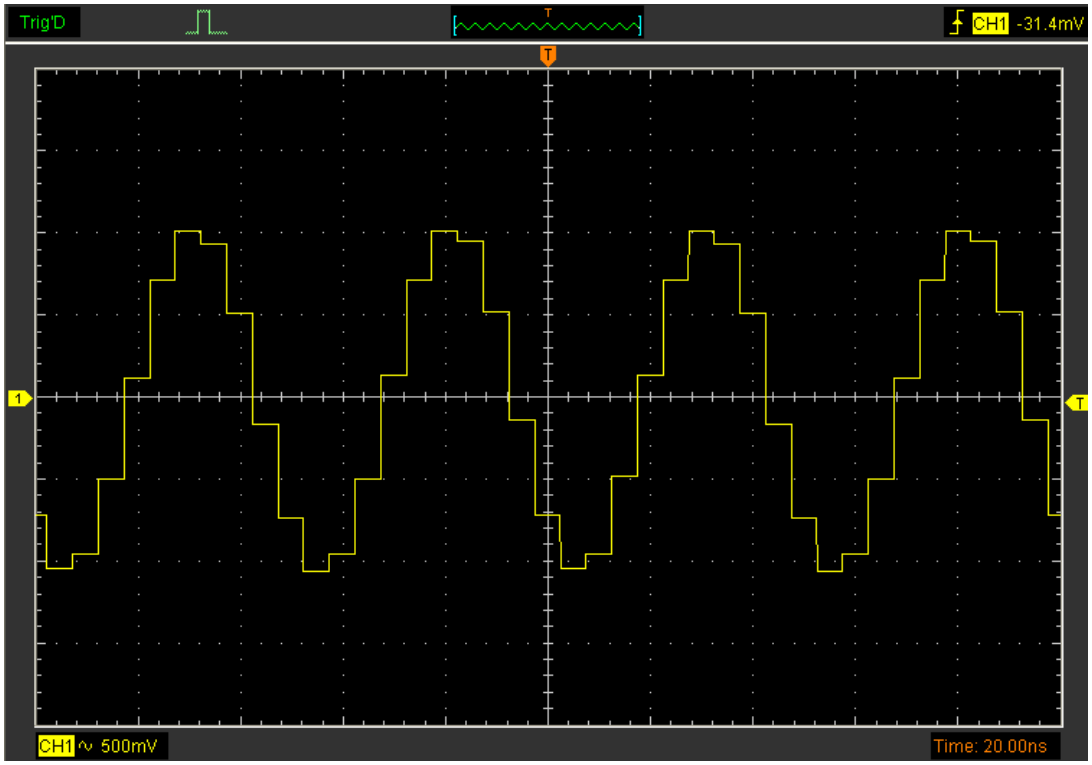
Also, you can drag waveform on right sidebar.



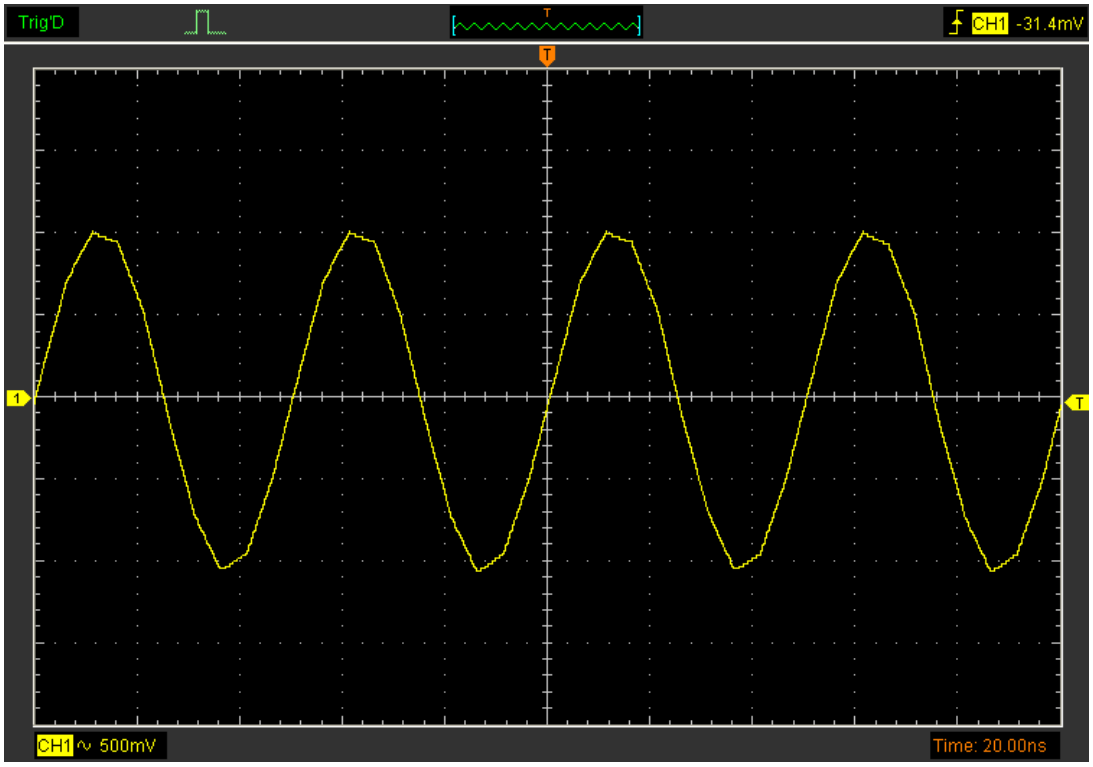
3.10 Interpolation

At the time base 40ns/div or faster, user can use the 3 different interpolation mode to get waveforms of different smoothness.
Click **“Acquire->Interpolation”** menu.

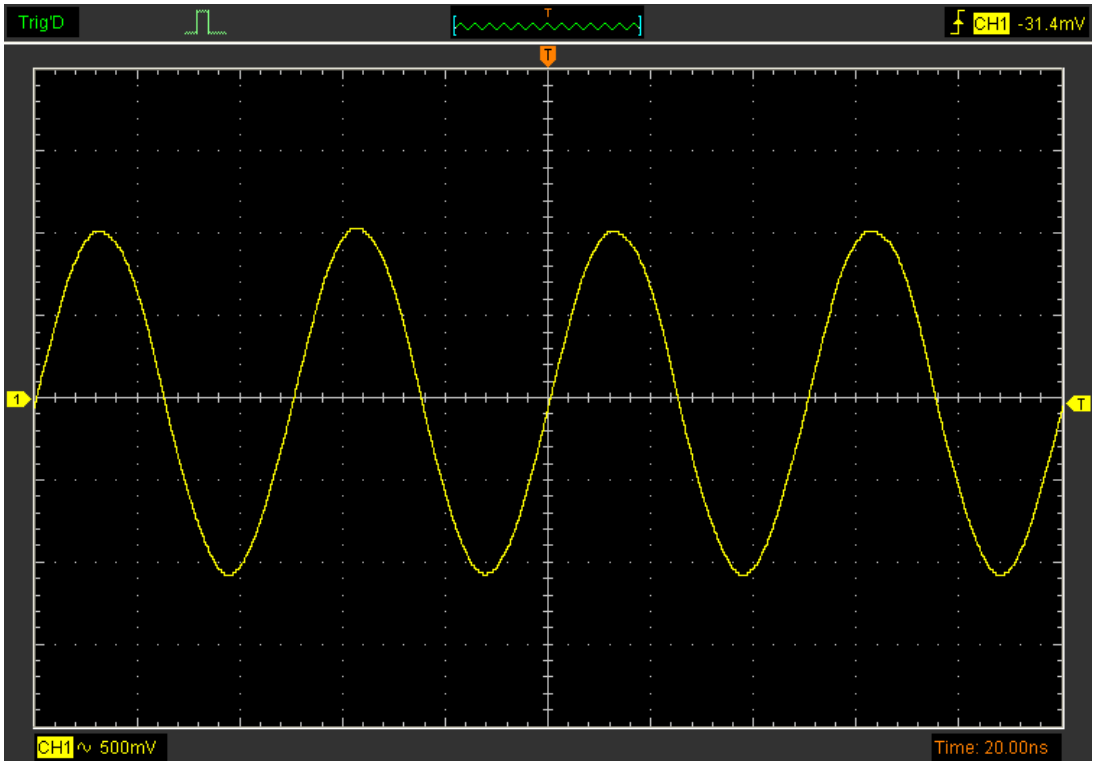
The **Step** Interpolation:



The **Linear** Interpolation:



The **Sin(x)/x** Interpolation:



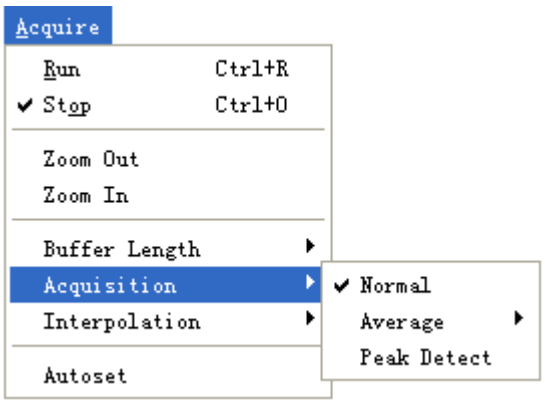
Note: The default interpolation mode is Sin(x)/x.

Acquisition

When you acquire a signal, the oscilloscope converts it into a digital form and displays a waveform. The acquisition mode defines how the signal is digitized and the time base setting affects the time span and level of detail in the acquisition.

3.11 Acquisition Modes

There are three acquisition modes: Normal, Average and Peak Detect.

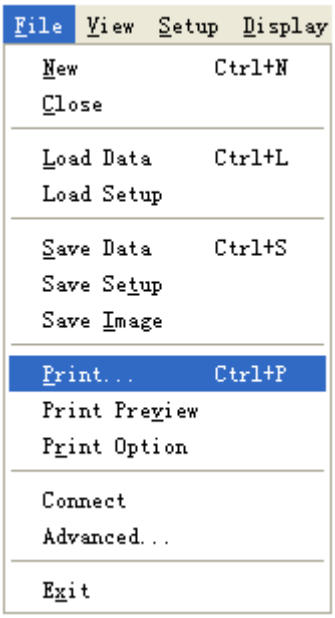


Normal: In this acquisition mode, the oscilloscope samples the signal in evenly spaced intervals to construct the waveform.

Average: In this acquisition mode, the oscilloscope acquires several waveforms, averages them, and displays the resulting waveform. You can use this mode to reduce random noise.

Peak Detect: In this acquisition mode, the oscilloscope finds the maximum and the minimum in every sampling interval, and use these values to show waveform.

3.12 Print And Print Preview

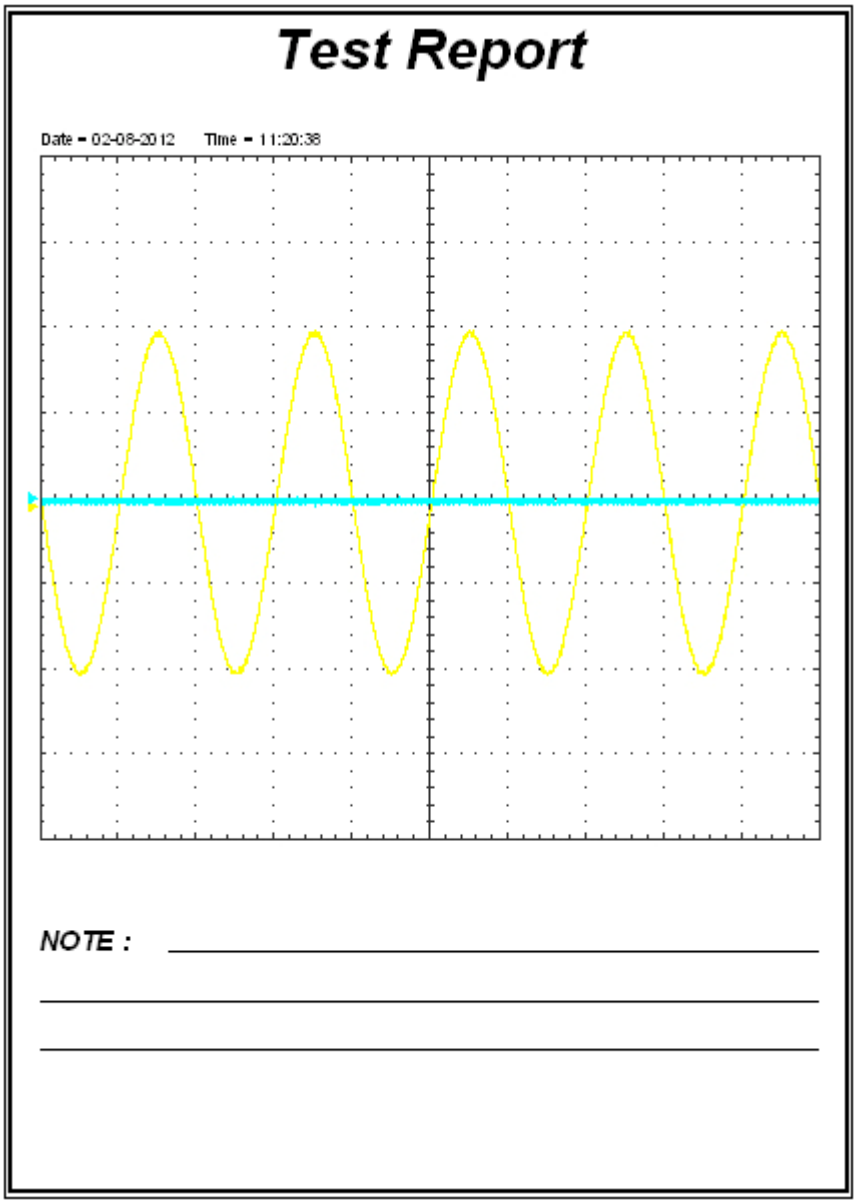


1. Click **"Print"** in **"File"** menu to set the printer to print the current waveform
2. Click the **"PrintPreview"** in **"File"** menu to get into the Preview window.

In **"PrintPreview"** window, use the **"Zoom In"** button and the **"Zoom Out"** button to change the

size of the waveform graph. Click the **"Close"** button to turn this window off and click the **"Print"** button to print the report.

The Print report:



Chapter 4 Application Example

◆Simple Measurement

◆Capturing a Single-Shot Signal

◆The Application of the X-Y

◆Taking Cursor Measurement

4.1 Simple Measurement

To acquire and display a signal, please do the steps as follows:

1. Connect signal to **CH1** by using probe

2. Click the button on toolbar or "**Acquire -> Auto Setup**" on menu.

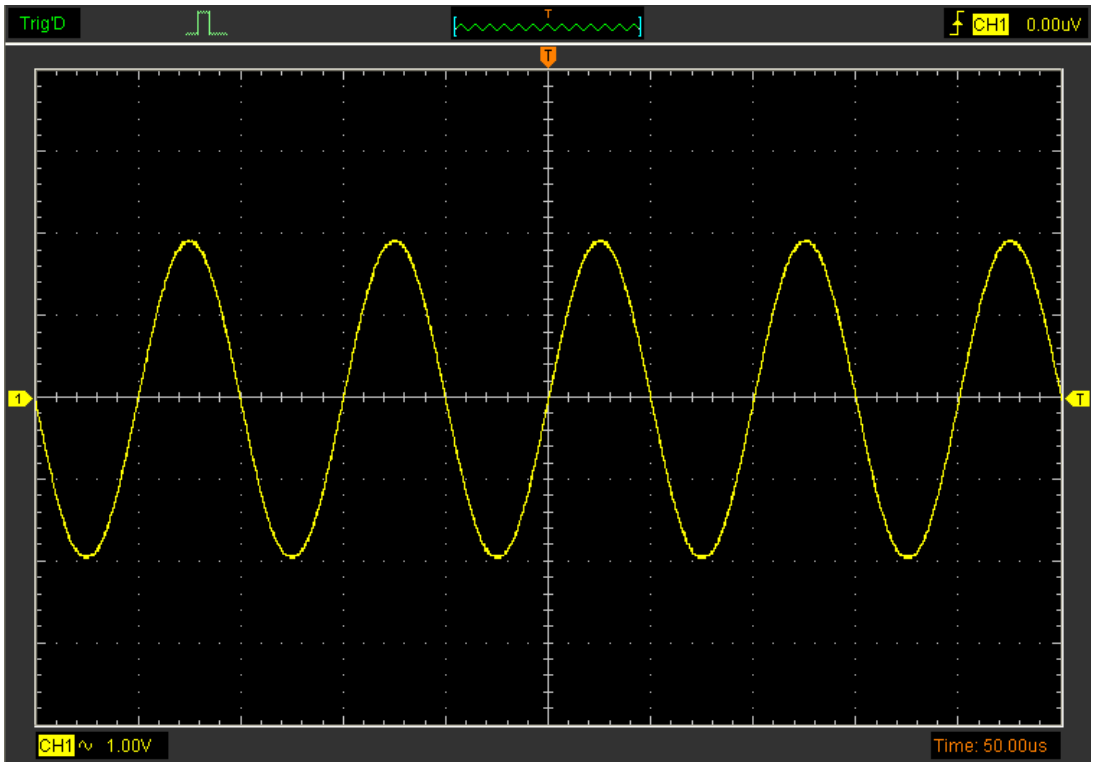
The DSO set the vertical, horizontal, and triggers controls at the best status automatically. Also, you can adjust the controls to meet your measurement to optimize the waveform display.

To measure the frequency and "**Vpp**", you can do these steps as follows:

1. Click the "**Measure->Horizontal->Frequency**" button, the frequency of the signal display on the bottom of the waveform interface.

2. Click the "**Measure->Vertical->Peak-to-Peak**" button, the "**Vpp**" of the signal will also display on the bottom of the waveform interface.

To clear the measurement on the waveform interface, click the "**Measure->Clear Measure**" button.



4.2 Capturing a Single-Shot Signal

To capture a single event, it needs to gather some pre-test knowledge of the signal in order to set up the trigger level and slope correctly. For example, if the event is derived from 3.3V COMS logic, a trigger level of 1.2 or higher Volts should work on a rising edge. Do these steps as follows:

1. Set the probe and the channel attenuations to X 10.

2. Set up the trigger in the Trigger Menu, or in the Trigger Setting window.

1) Adjust the Trigger Mode to Edge.

2) Set the Trigger Sweep to Single.

3) Set the Trigger Source to CH1.

4) Set the Trigger Slope to "+" which means you select the rising edge.

5) Adjust the Volts/Div and the time base in a proper range for the signal.

6) Drag the trigger level sign on the waveform display screen to proper position. It ally higher a little above the normal level.

7) Click **START** button to start capturing. When the trigger conditions are met, data appears on the display representing the data points that the oscilloscope obtained with one acquisition.

This function helps to capture the signal occurrence easily, such as the noise with large amplitude; set the trigger level higher a little above the normal level and press and wait. When noise occurs, the instrument will record the waveform before and after the trigger.

4.3 The Application of the X-Y Operation

X-Y Plot acts to analyze correlation of data of two channels. Lissajous diagram is displayed in the screen when you use **X-Y** Plot, which enables to compare frequencies, amplitudes and phases of counterpart waveform against the reference waveform. This makes it possible to compare and analyze frequency, amplitude and phase between input and output.

Do these steps as follows:

1. Set the probe attenuation to "**x10**" Set the switch to "**x10**" on the probes.

2. Connect the CH1 probe to the input of the circuit, and connect the CH2 probe to the output of the circuit.

3. Click button.

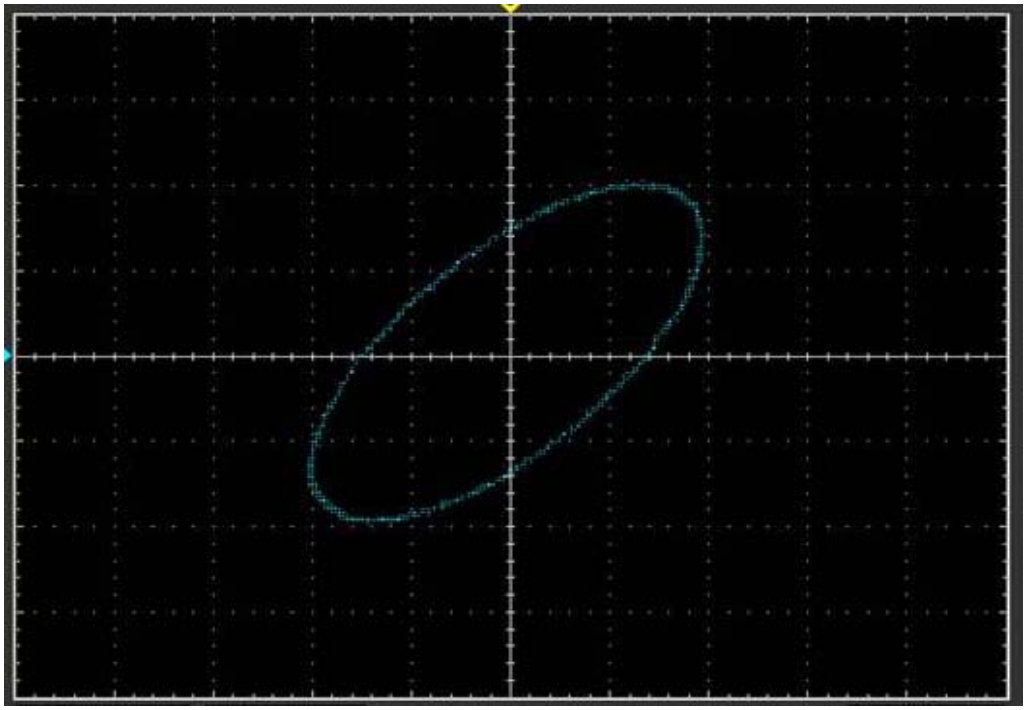
4. Adjust the vertical scale and offset to display approximately the same amplitude signals on each channel.

5. Select X-Y format at Horizontal window. The oscilloscope will displays a Lissajous pattern representing the input and the output characteristics of the circuit.

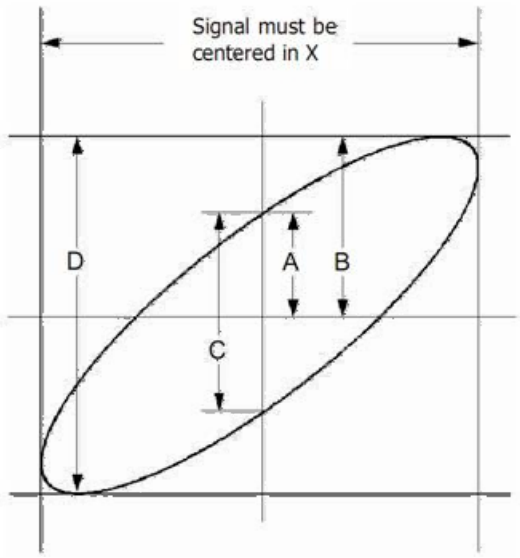
6. Adjust the scale and offset of the horizontal and vertical to a desirable waveform display. The following picture shows a typical example.

7. Apply the Ellipse Method to observe the phase difference between the two channels.

Signal in X-Y Format:



Instruction of the Ellipse Method



Sinθ = A/B or C/D, where θ = phase shift (in degrees) between the two signals.

From the formula above:
θ **= _arcsine (A/B) or _arcsine (C/D)**

θ must be in the range of (0~π/2) or (3π/2~2π) if the main axis of the ellipse is between I and III quadrant, . If the main axis is at II and IV quadrant, θ must be in the range of (π/2~π) or (π~3π/2).

4.5 Taking Cursor Measurements

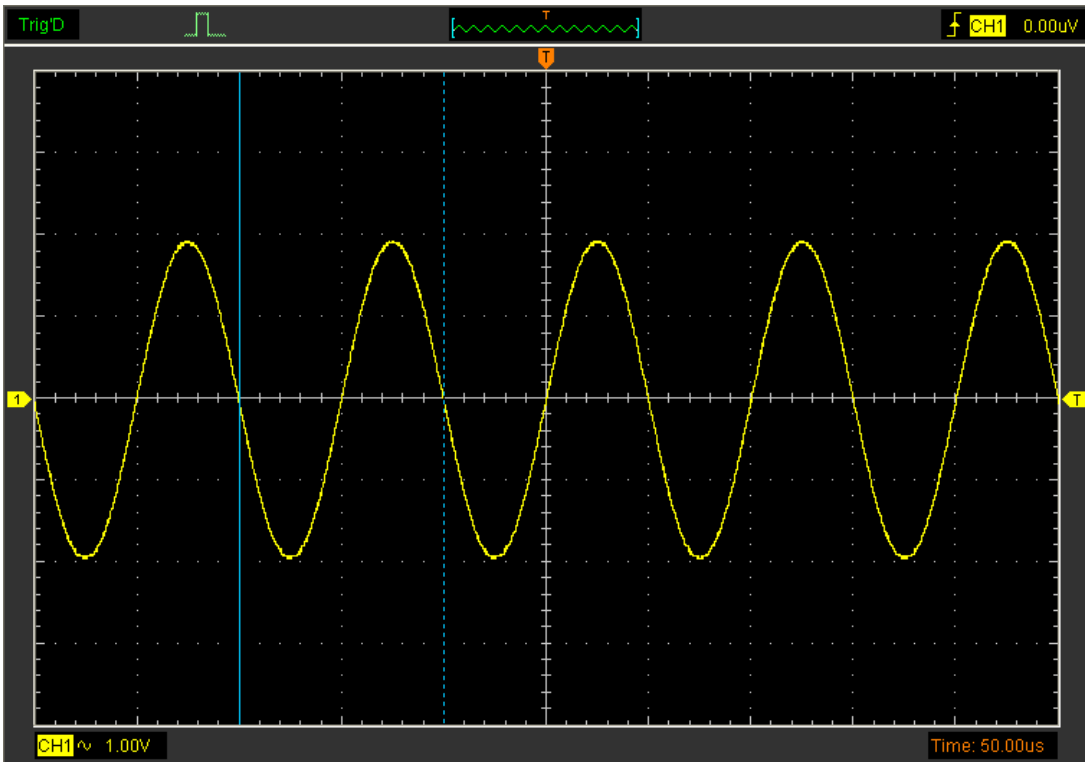
Use cursors to make time and amplitude measurements on a waveform quickly.

Measure the Peak Frequency or Time of the First Sine Waveform

Do these steps:

1. Click **"Cursor->Source"**, select CH1 (select CH2 if you want measure CH2).
2. Click **"Cursor->Type"**, select Vertical.
3. Push left mouse button, and the vertical lines appear.
4. Drag the mouse button to the point you want to measure.
5. Release the left mouse button, the frequency difference and time difference will be shown at the status bar.

Measure the Frequency and Time:



Read the details showing in the status bar.

Freq: 10.00KHz Time: 100uS

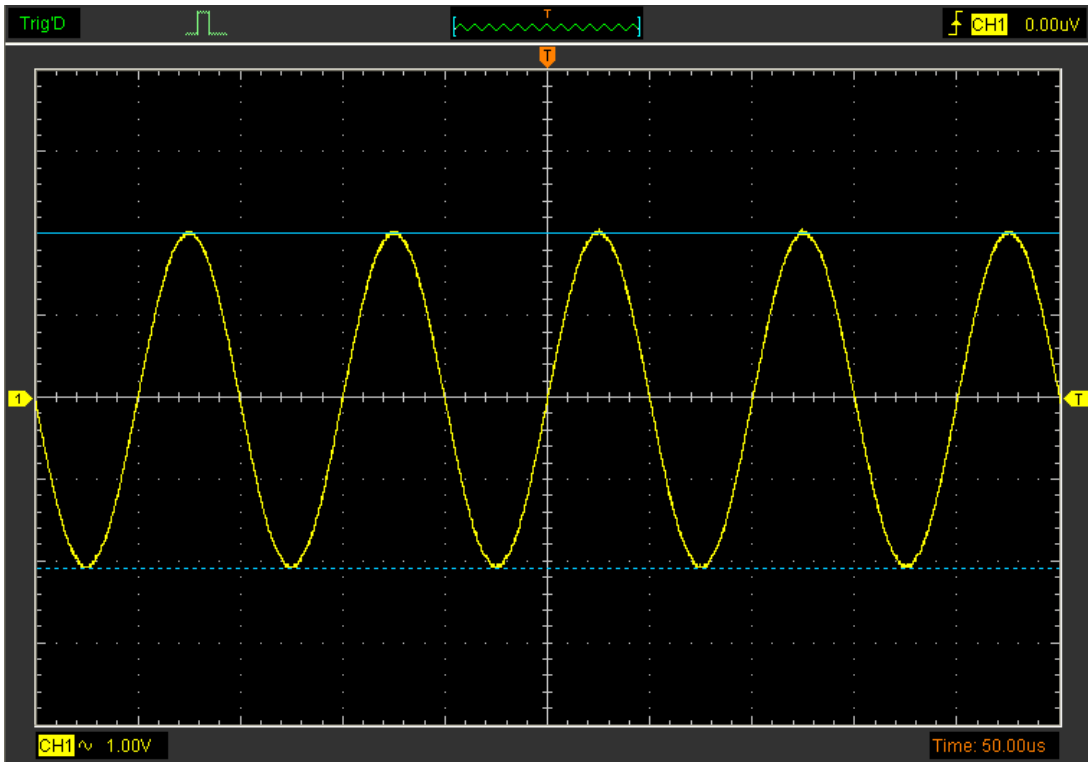
Measure the Amplitude of the First Waveform Peak of the Waveform

Do these steps:

1. Click "**Cursor->Source**", select CH1 (select CH2 if you want measure CH2).
2. Click "**Cursor->Type**", select Horizontal.

3. Push left mouse button, and the Horizontal lines appear.
4. Drag the mouse button to the point you want to measure.
5. Release the left mouse button, the voltage difference will be shown at the status bar.

Measure the Amplitude:



Read the details showing in the status bar.

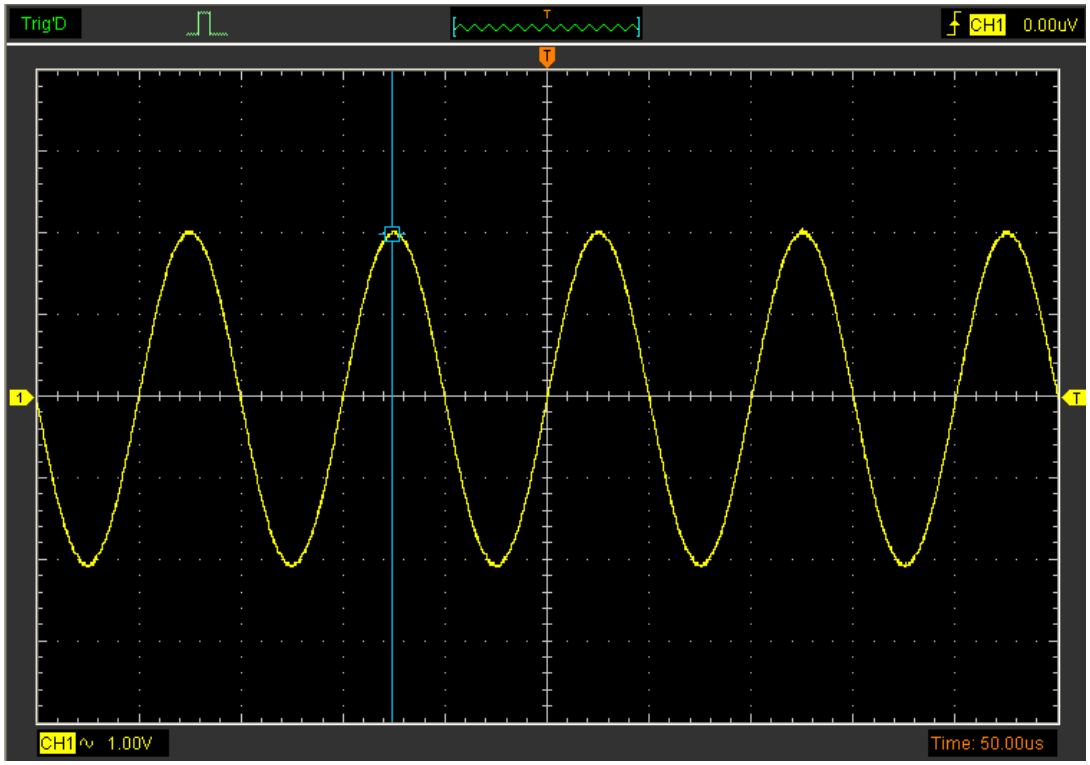
Volt: 4.00V

Trace the Amplitude of a fixed position on X-axis in a Waveform

Do these steps:

1. Click "**Cursor->Source**", select CH1 (select CH2 if you want trace CH2).
2. Click "**Cursor->Type**", select Trace.
3. Click the cursor at the position that you want traced of the wave in the waveform window.

Trace the Amplitude:



Read the details showing in the status bar.

Volt: 2.02V

Note: Click "**Cursor->Type**", select "**Cross**", you can measure time and amplitude at one time.

Chapter 5 Appendix

- **Appendix A: Specifications**
- **Appendix B: Accessories**
- **Appendix C: General Maintenance**

Appendix A: Specifications

Specifications Table:

Vertical	
Analog Channel	2
Bandwidth	100MHz (DSO3102) 150MHz (DSO3102A) 200MHz (DSO3202) 250MHz (DSO3202A)
Rise Time	3.5ns (DSO3102) 2.3ns (DSO3102A) 1.7ns (DSO3202) 1.4ns (DSO3202A)
Input Impedance	Resistance: 1MΩ; Capacitance: 25 pF
Input Sensitivity	1mV/div to 5V/div
Input Coupling	AC/DC/GND
Vertical Resolution	8 bits
Memory Depth	10K-256M/CH
Input Protection	400V (DC+AC Peak)
Horizontal	
Real-Time Sampling Rate	1GSa/s
Time Base Range	5ns/div to 1000s/div(1-2-5 sequences)
Time Base Precision	±50ppm
Trigger	
Source	CH1, CH2, EXT, EXT/5.
Mode	Edge, Pulse, Video, Alternative, Slope and OverTime
X-Y MODE	
X-Axis Input	CH1
Y-Axis Input	CH2
Phrase Shift	Max.3 degree
Cursor and Measurement	
Voltage Measurement	Vpp, Vamp, Vmax, Vmin, Vtop, Vmid, Vbase, Vavg, Vrms, Vcrms, Preshoot, Overshoot
Time Measurement	Frequency, Period, Rise Time, Fall Time, Positive Width, Negative Width, Duty Cycle
Cursors Measurement	Horizontal ,Vertical, Track, Auto Measure Modes
Waveform Signal Process	+,- , x,÷, /,FFT, Invert
Voltage Range	
	1mV to 5V/div @ x 1 probe
	10mV to 50V/div @ x 10 probe
	100mV to 500V/div @ x 100 probe
	1V to 5000V/div @ x 1000 probe
	10V to 50000V/div @ x 10000 probe
	20mV to 100V/div @ 20:1

Others	
Current Range	CC65(20A),CC65(60A),CC650,CC1100
Cursor	Time/frequency difference, voltage difference
FFT	Rectangular, Hanning, Hamming, Blackman Window
MATH	Addition, subtraction, multiplication, division
Autoset	Yes
Interface	USB 2.0
Power Source	8--36V Wide range of input voltage
Volume	255 x 190 x 45 (mm)
Weight	1Kg

Appendix B: Accessories

	X1, X10 two passive probes. The passive probes have a 6MHz bandwidth (rated 100Vrms CAT III) when the switch is in the X1 position, and a maximum bandwidth (rated 300Vrms CAT II) when the switch is in the X10 position. Each probe consists of all necessary fittings.
	A power adapter special for this product. In addition to the power adapter shipped with your instrument, you may purchase another one certified for the country of use.
	A USB line, used to connect external devices with USB interface like a printer or to establish communications between PC and the oscilloscope.
	A software installation CD and it contains the user manual for the oscilloscopes.

Appendix C: General Maintenance

General Care

Do not store or leave the oscilloscope where the device will be exposed to direct sunlight for long periods of time.

Caution

To avoid damages to the device or probes, do not expose them to sprays, liquids or solvents.

To avoid damages to the surface of the device or probes not use any abrasive or chemical cleaning agents.

Cleaning

Inspect the device and probes as often as operating conditions require. Make sure the device disconnect form all power sources.

To clean the exterior surface, perform the following steps:

1. Remove loose dust on the outside of the oscilloscope and probes with a lint-free cloth. Use care to avoid scratching the clear glass display filter.

2. Use a soft cloth dampened with water to clean the device.